TRADITIONAL FOOD SECURITY AND DIET QUALITY IN ALASKA NATIVE WOMEN

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TRADITIONAL FOOD SECURITY AND DIET QUALITY IN ALASKA NATIVE WOMEN

A

DISSERTATION

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By

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Abstract

This dissertation addresses the need for a better understanding of traditional foods, food security, and diet quality and how they collectively influence health of low income Alaska Native women receiving the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). The ultimate aims are to understand the beliefs and behaviors regarding traditional foods in low income Alaska Native women in Anchorage receiving WIC assistance and examine whether these foods moderate the relationship between food security and diet quality. Food security is a growing public health concern in Alaska, especially among Alaska Native people living in urban areas. I begin the dissertation by conducting a literature review on traditional food security research in Alaska, examining research that has been conducted in the past decades. The review yielded a total of 28 articles for the systematic review, where traditional food security was categorized into three main types of research: those that quantified traditional food intake (n=19), those that quantified food security (n=2), and qualitative articles that addressed at least one pillar of food security (n=8). The three categories were used to evaluate how traditional foods relate to the pillars of food security in Alaska and determine future research needs. I estimated the intake of traditional food among urban Alaska Native women receiving WIC assistance and examined the associations between participants' practices, attitudes, and beliefs of traditional foods. Results indicate that participants are mixed on their opinion of the economic value of traditional foods and the healthfulness of traditional foods over store bought foods. Linear regression analysis shows that participants who ate more traditional foods are more likely to have traveled to a rural Alaska Native community in the past year (p=.001) and have a preference for traditional foods over store bought foods (p=.001). Finally I estimated diet quality and food security of Alaska Native women receiving WIC assistance who are living in an urban community in order to understand how intake of traditional foods affects these estimates. Results indicate the average intake of traditional foods is 3.7% of total calories and participants' diet quality was lower than the national average, with a 48 on the Health Eating Index (HEI). Multivariate regression analysis with significance at P<= .05 indicates that participants with increasing traditional food intake are positively associated with higher diet quality scores. An increase of 10% of traditional foods yielded an increase of 7.3 points on the HEI. Increased education and advocacy of traditional food intake for this population can help

increase overall nutrition and long-term health status. Based on the collective findings from the research I recommend the following measures: 1) ensure that nutrition education in food and nutrition assistance programs to be culturally relevant and address the barriers associated with access and availability of traditional foods in urban areas, 2) use the data to inform intervention programs to improve dietary adequacy in this high-risk population, and 3) modify the list of foods acceptable for purchase through the WIC program to promote diet quality and aid in chronic disease prevention in the Alaska Native population.

Table of Contents

List of Figures

Page

List of Tables

Page

Acknowledgements

I would like to thank all the women who participated in the research project and provided their valuable thoughts and information. I would also like to acknowledge the staff at the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in Anchorage, Alaska. Their time and assistance promoting the research and arranging participant interviews was vital to its success. Additionally, the study was supported in part through the University of Alaska Anchorage's Center for Community Engagement & Learning (CCEL). The grants provided financial assistance to buy gift cards for research participants.

I would also like to thank my advisor, Dr. Andrea Bersamin, for her continued support and encouragement throughout my dissertation process. Dr. Bersamin contributed to every aspect of the design, implementation, and analysis of the research with her time, insights, and guidance. She also provided many edits and suggestions to the dissertation paper in order to strengthen the work. Without her patience and expertise the project would not have been possible. My committee, Dr. Philip Loring, Dr. Rhonda Johnson, and Dr. Ellen Lopez were also instrumental. Their knowledge and expertise through the research design process and editing for the dissertation writing was very thoughtful and added much depth to the work. I appreciate your time and dedication to this important research. My research assistant, Melissa Tholl, also contributed by developing various resources for participants during the interviews, conducting participant interviews, and helping to create the database necessary for data collection and analysis. Her dedication to the project and its excellence was evident on a daily basis. Our statistician, Dr. Janet Johnston, was also key in the statistical analysis of the data. Her talent and willingness to assist as needed was much appreciated.

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General Introduction

This dissertation addresses the need for a better understanding of traditional foods, food security, and diet quality and how they collectively influence the health of low income Alaska Native women. The ultimate aims are to understand the beliefs and behaviors regarding traditional foods in low income Alaska Native women in Anchorage and examine whether these foods moderate the relationship between food security and diet quality. Currently it is unknown if any associations exist between diet quality and food security, and how these associations may be impacted by beliefs and behaviors regarding traditional foods. Food security is a growing public health concern in Alaska, especially among Alaska Native people living in urban areas.

In Alaska Native communities changes are occurring in the physical and social environments that negatively impact access to and intake of traditional foods. Traditional foods protect against the development of chronic diseases and have been associated with better health outcomes such as improved glucose tolerance and lipid profiles (Johnson, Nobmann, & Asay, 2012) and lower the risk of cardiovascular disease (Nobmann, Byers, Lanier, Hankin, & Jackson, 1992). People who consume higher levels of traditional foods also consume higher levels of important nutrients, such as fat-soluble vitamins, protein, and omega-3 fatty acids (Ballew, Tzilkowski, Hamrick, & Nobmann, 2006; Bersamin, Zidenberg-Cherr, Stern, & Luick. 2007; Johnson, Nobmann, Asay, & Lanier, 2009; Risica, Nobmann, Caulfield, Schraer, & Ebbesson, 2005; Sharma, Mead, Simeon, Ferguson, & Kolahdooz, 2015). The changes communities are experiencing are commonly referred to as nutrition transition, or the 'westernization' of dietary intake and lifestyle practices that include an increased intake of store bought foods and a reduced consumption of traditional foods. In Alaska nutrition transition is occurring in both rural and urban communities (Bersamin, Luick, Ruppert, Stern, & Zidenberg-Cherr, 2006; Bersamin et al., 2007; Johnson et al., 2012).

Traditional food security can be defined as the continued and predictable availability of and access to food derived from northern environments (Paci, Dickson, Nickels, Chan, & Furgal, 2004), and includes the ready availability of nutritionally adequate and safe foods at all times for

an active healthy life. Traditional food security intertwines the cultural, physical, emotional, and spiritual beliefs and practices of traditional foods (Guyot, Dickson, Paci, Furgal, & Chan, 2006).

Traditional foods, also called "country", "subsistence", or "native foods" refer to a wide variety of foods harvested from the local environment and consumed by many indigenous peoples in Alaska. Although traditional foods vary by geographic area they can include land and marine mammals, fish, plants such as seaweed and sourdock, and berries such as blueberries and salmonberries. Traditional foods are tied to the cultural practices and spiritual beliefs of indigenous peoples and are central to their social and physical well-being (Guyot et al., 2006; Paci et al., 2004; Power, 2008).

Food security is a concept that measures an individual's access to adequate, nutritious, safe, and culturally appropriate foods that allows people to lead an active and healthy life. The United States Department of Agriculture (2015) definition also includes the ability to acquire foods in socially acceptable ways (United States Department of Agriculture, 2015). In order to conceptualize food security it is important to understand what is included within the framework. Food security includes three dimensions or pillars: food availability, food access, and food utilization. Food availability includes sufficient quantities of food available on a consistent basis. Food access is the ability to purchase food and is determined by household income. Food utilization is the ability to improve nutrient intake and/or meet daily nutrient requirements.

Few contemporary measures of food security take into account traditional food systems or conceptualizations of food security for indigenous people (Kuhnlein & Receveur, 1996; Loring & Gerlach, 2009; Power, 2008). However, whether living in rural or urban communities, traditional food is central to the physical well-being of indigenous people (Kuhnlein & Receveur, 1996; O'Keeffe & Reimer, 2010; Power, 2008) and food security is contingent upon access to these foods (Lambden, Receveur, & Kuhnlein, 2007; Sharma, 2010). There is considerable regional variation in the ability to attain these foods (Burke, Durr, & Coalition, 2013; Lambden, Receveur, & Kuhnlein, 2007; Schuster, Wein, Dickson, & Chan, 2011).

Women are vulnerable to food insecurity, particularly if they are low income (Food and Agriculture Organization, 2015; Holben, 2010; Ivers & Cullen, 2011). In indigenous populations the rates of food insecurity are also higher (Tarasuk, 2005; Willows, Veugelers, Raine, & Kuhle, 2009) with women of childbearing age of particular concern due to the potential impact on reproductive health (Schaefer, Erber, Trzaskos, Roache, Osborne, & Sharma, 2011). In Alaska food insecurity rates are 10.3% for women and 19.2% for Alaska Native peoples (Alaska Department of Health and Social Services, 2015).

This research was conducted at two Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) clinics in the Municipality of Anchorage. Participants identified themselves as Alaska Native, were of childbearing age, and were not pregnant or breastfeeding. The interviewer-administered surveys were conducted between September 2014 and June 2015. It was thought that conducting surveys on dietary intake, traditional food intake, and food security would provide a unique opportunity to collectively understand their associations and how they come together to influence health. The following paragraph provides a brief overview of the three topics that comprise the dissertation.

I begin the dissertation by conducting a literature review on traditional food security research in Alaska, examining research that has been conducted in the past decades. The review included a total of 28 articles. Articles were categorized into three main types of research: those that quantified traditional food intake (n=19), those that quantified food security (n=2), and qualitative articles that addressed at least one pillar of food security (n=8). The three categories were used to evaluate how traditional foods relate to the pillars of food security in Alaska and determine future research needs. The second chapter describes the estimated intake of traditional food among urban Alaska Native women and examines the associations between participants' attitudes and beliefs and intake of traditional foods. The third chapter reports on the estimated diet quality and food security of low income, Alaska Native women living in an urban community and seeks to understand how intake of traditional foods affects these estimates. Increased education and advocacy of traditional food intake for this population can help increase overall nutrition and long-term health status.

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Chapter 1 Traditional Food Security in Alaska: A Review of the Literature[1]

1.1 Abstract

Food insecurity is a growing public health concern in Alaska. Food security includes the pillars of food access, food availability, and food utilization, and for some indigenous peoples this constitutes traditional foods that are available and accessible in the local community. The inclusion of traditional foods within the food security framework is the foundation of traditional food security. The objective of the review is to conduct a systematic review on traditional foods and food security and to identify the factors associated with traditional food security in Alaska. Using two databases for the search, a total of 48 articles were found; Google Scholar included 22 articles or documents and the High North Research Documents included two additional articles for a total of 24. The selected research revealed 3 types of studies, including quantitative articles on traditional food intake, and both quantitative and qualitative articles on food security. These 3 types of studies highlight the differing factors impacting traditional food security in Alaska. In conclusion, limited research is available in Alaska on food security issues. Very few studies directly measure food security while others provide a qualitative review of food security factors. Research looking at dietary intake of traditional foods is more common, though many differences exist among age groups and geographical areas. Future research should include direct measurements of traditional food intake and food security to understand the complete picture of traditional food security in Alaska.

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1.2 Introduction

The circumpolar north is unique in its diversity of indigenous cultures, extreme climate, low population density, and vast geographical areas, and when these factors are taken together, the region warrants special consideration for food security and food security research. The circumpolar region encompasses the countries of Canada, the United States (Alaska), Russia, Finland, Sweden, Norway, Iceland, and Denmark (Greenland). Understanding food security is important because of its direct relationship to health. Individuals who experience food insecurity have poor physical and mental health, and can experience hunger, poor nutritional quality, and disordered eating patterns (Burke, Durr, & Alaska Food Coalition, 2013; Leung, Epel, Ritchie, Crawford, & Laraia, 2014; Whitaker, Phillips, & Orzol, 2006). A recent meta-analysis of food security research in the circumpolar north identified primary drivers of food insecurity in the region (Loring & Gerlach, 2015). Despite many similarities, countries within the circumpolar region also have important differences that may impact food security. From policy and government regulations for hunting and harvesting traditional foods, to the species available within the landscapes, to local preferences, each area requires an individualized assessment of food security research. The focus of the literature review will be on factors influencing food security in Alaska.

Traditional foods, also called "country," "subsistence," or "native foods" refer to a wide variety of foods harvested from the local environment and consumed in the diet of many indigenous peoples in Alaska. Although traditional foods vary by geographic area they typically include land and marine mammals, fish, plants such as seaweed and sourdock, and berries such as blueberries and salmonberries. Traditional foods are central to the food security of indigenous peoples (Power, 2008). Traditional foods incorporate the cultural practices and spiritual beliefs of indigenous peoples and are central to their social and physical well-being (Guyot, Dickson, Paci, Furgal, & Chan, 2006; Paci, Dickson, Nickels, Chan, & Furgal, 2004; Power, 2008). Traditional foods are also a source of important nutrients and have a positive correlation to diet quality (Bersamin, Zidenberg-Cherr, Stern, & Luick, 2007; Kuhnlein & Receveur, 2007; Nobmann et al., 2005).

In communities across Alaska, a mix of both traditional foods and store-bought foods are consumed. The Alaska Department of Fish and Game estimates that Alaskans harvest 52 million pounds of fish and game each year for subsistence food; in rural areas, the annual harvest averages 316 pounds per person, whereas in urban areas the harvest averages 23 pounds per person annually (Wolfe, 2004). It is estimated that 65% of Alaska residents practice some form of subsistence (Alaska Department of Health and Social Services, 2015) and these foods make up 15-22% of the diet in some rural Alaska Native communities (Ballew, Tzilkowski, Hamrick, & Nobmann, 2006; Bersamin et al., 2007; Nobmann et al., 2005). In rural Alaska Native communities the availability of store-bought food is affected by factors such as limited infrastructure, extreme and unpredictable weather, and lack of storage facilities (Gerlach & Loring, 2013; Hinzman et al., 2005; Hovelsrud, McKenna, & Huntington, 2008; Magdanz, Smith, Braem, Fox, & Koster, 2011), making traditional foods an essential part of the diet.

Traditional food security can be defined as the continued and predictable availability and access of food derived from northern environments (Paci et al., 2004), and includes the ready availability of nutritionally adequate and safe foods at all times for an active healthy life. Traditional food security intertwines the cultural, physical, emotional, and spiritual beliefs and practices of traditional foods (Guyot et al., 2006). Few contemporary measures of food security take into account traditional food systems or conceptualizations of food security for indigenous people (Kuhnlein & Receveur, 1996; Loring & Gerlach, 2009; Power, 2008). However, whether living in rural or urban communities, traditional food is central to the physical and mental well-being of indigenous people (Kuhnlein & Receveur, 1996; O'Keeffe & Reimer, 2010; Power, 2008) and food security is contingent upon access to these foods (Lambden, Receveur, & Kuhnlein, 2007; Sharma, 2010). There is considerable regional variation in the ability to attain these foods (Burke et al., 2013; Lambden, Receveur, Marshall, & Kuhnlein, 2006; Schuster, Wein, Dickson, & Chan, 2011).

In order to conceptualize food security, it is important to understand what is included within the framework. Food security includes three dimensions or pillars: food availability, food access, and food utilization. Food availability includes sufficient quantities of food available on a consistent basis. Food access is the ability to purchase food or the ability to attain foods from

other sources, including foods that are preferred based on culture or religion. Food utilization is the ability to improve nutrient intake and/or meet daily nutrient requirements. Figure 1.1 lists the main components within each of the three pillars of food security.

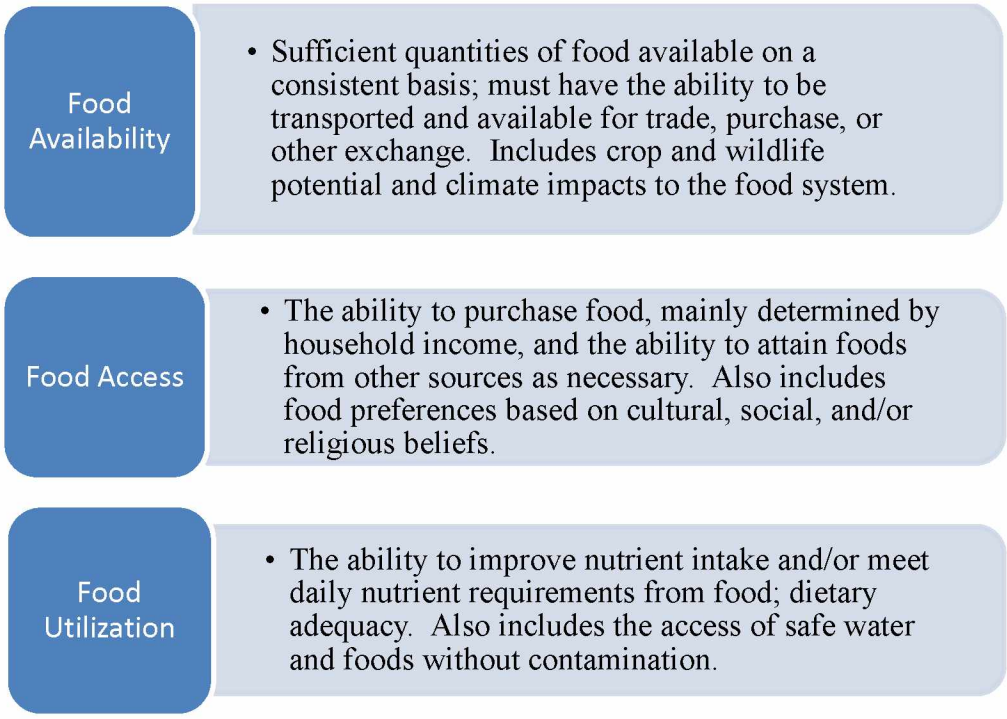

Figure 1.1 Pillars of Food Security

When someone is food insecure it impacts their emotional, social, and physical health. Understanding the prevalence of traditional food insecurity and its causes and consequences in Alaska is important to public health professionals, food assistance programs, policy makers, tribal leaders, and ultimately the health of Alaska Native people. There is a need to synthesize research evidence about traditional food security to better determine who is at risk, why they are at risk, and develop strategies and interventions to make the necessary changes (Loring & Gerlach, 2015). The objectives of this systematic review are to 1) review current approaches to understanding food security in Alaska, 2) evaluate what is known about causes and consequences of traditional food security in Alaska as they relate to the three pillars of food security, and 3) discuss future research needed in the field.

1.3 Methods

Data Sources

In September 2015 peer-reviewed primary research documents were identified using 2 online databases, Google Scholar and the High North Research Documents. The search included articles and documents from qualitative or quantitative studies that addressed traditional food intake and/or 1 or more pillars of food security.

Study Inclusion and Exclusion Criteria

For inclusion in the systematic review, the article or report had to meet several criteria. The article had to 1) be written in English, 2) be primary quantitative or qualitative research that addresses at least 1 pillar of food security and/or traditional food intake, 3) include human research subjects, 4) include traditional food intake or food security as part of the objectives, and 5) be located in Alaska. Articles that did not measure either food security or traditional food intake, were review articles, or reported on "local" food instead of "traditional" foods were excluded from the systematic review. This last criterion is important regionally because there are specific legislative definitions of what constitutes "traditional" foods that may or may not align with what people themselves consider "local" or "country" foods (Loring & Gerlach, 2010a; Gerlach, Loring, Turner, & Atkinson, 2011). This may be a weakness of our design with respect to reviewing all literature relevant to how Alaskans meet food security needs outside of market foods purchased with cash, but adds clarity to our assessment of literature that focuses on foods construed as 'traditional.' Review of the articles started with a keyword search in the databases, then abstracts were reviewed to ensure inclusion criteria were met. Keywords and inclusion criteria can be found in Figure 1.2.

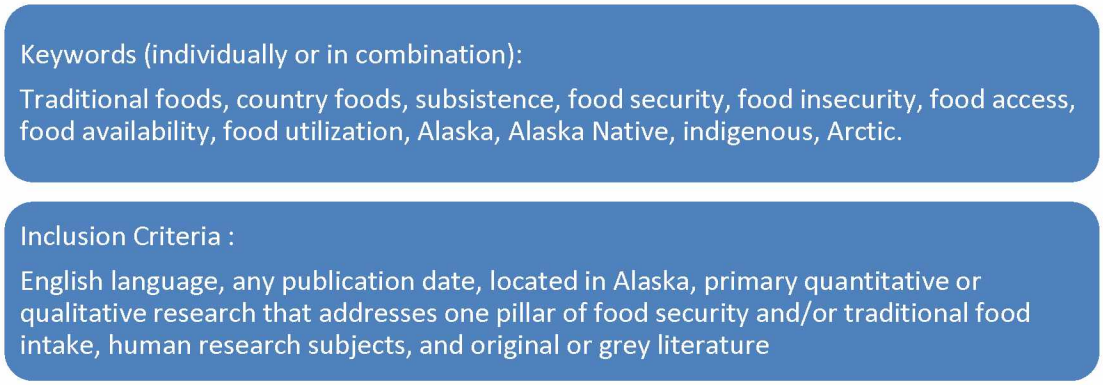

Figure 1.2 Keywords and Inclusion Criteria

1.4 Results

The search on Google Scholar yielded 54,700 hits. The abstracts from the first 100 articles were reviewed, after which no other articles were relevant to the keywords searched; 24 articles met the inclusion criteria and were selected for the review. The High North Research Documents database yielded 3,264 initial hits with filters for Alaska and papers written in English. The abstracts from the first 80 documents, after which no other articles were relevant to the keywords searched, were reviewed for inclusion criteria, and for duplication from the previous database. An additional 4 articles were selected for the review. The process yielded a total of 28 articles for the systematic review. See Figure 1.3 for a flow chart of references included in the systematic review.

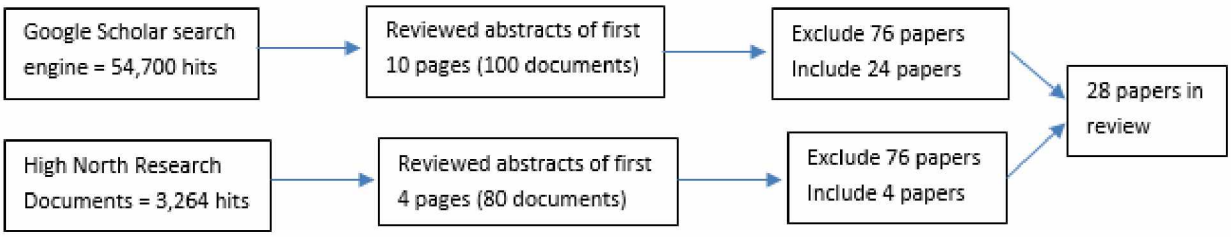

Figure 1.3 Flowchart of References Included in the Systematic Review

Table 1.1 summarizes the results by the type of article, the geographic location, the study population, and the pillars of food security. These categories were selected to determine what food security measures have been used in the state, where those measures were taken, the type of

data collected, the population investigated, and the gaps of understanding from the literature on traditional food security in Alaska.

Table 1.1 Food Security Pillars Matrix

Article(s)	Study & Objective	Geographic Location	Study Population	Diet Measured? How?	Food Security Measured? How?	Food Security Pillar	Findings/ Conclusion
Quantitative Traditional Food Intake Articles							
Ballew et al. (2004) & Ballew et al. (2006)	The Alaska Traditional Diet Survey To describe the use of subsistence and purchased foods by residents of rural Alaska villages.	13 villages in 5 Regional Health Corporation areas (Norton Sound Health Corp.; Tanana Chiefs Conference; Yukon-Kuskokwim Health Corp.; Bristol Bay Area Health Corp.; and South East Alaska Regional Health Corp.)	665 participants aged 13-88 years; 253 men, 401 women.	Yes – interviewer administered FFQ with portion sizes over the past 12 months	No	Food Access	Identified reasons for eating less traditional foods: Lack of hunter in the home; lack of time to hunt; living away from the village; inadequate transportation to hunt and gather; lack of traditional knowledge;
						Food Utilization	Traditional foods have high nutrient density; accounted for ~20% of total energy in 4 regions; 40+% of protein and Vitamin A, 75+% of Vitamin B12 & 90+% of omega-3 fatty acids in all regions

Table 1.1 Food Security Pillars Matrix continued

Bartell et al. (1999)	What People Eat: Atka, Alaska, 1998-1999 To define the quantity of traditional foods consumed, preparation methods of selected foods, the nutrition value of the total diet, and the nutritional contributions of Native foods to the total diet.	Atka, Alaska in 1998-1999	34 of the 80 residents in Atka	Yes – FFQ and a 24 hour recall	No	Food Utilization	A variety of traditional foods were consumed and contribute to the overall diet; the average intakes were adequate for protein, vitamin A, vitamin E, vitamin C, many B vitamins, phosphorus, iron, and selenium. The average intakes of fat and saturated fat were above recommendations and calcium, folate, fiber, and magnesium were below recommendations.
Bersamin et al. (2006)	The Center for Alaska Native Health Research (CANHR) Study Describe the nutrient intake of Yup'ik Eskimos in comparison with national intake, identify dietary sources of key nutrients, and assess the utility of the Healthy Eating Index to measure diet quality.	Three villages in the Yukon Kuskokwim River Delta, AK in September 2003	48 male and 44 female Yup'ik Eskimos aged 14-81 years.	Yes – single 24-hour recall	No	Food Utilization	The diet quality of participants was low and classified as poor. Traditional foods and healthy store bought foods should be encouraged.

Table 1.1 Food Security Pillars Matrix continued

Bersamin et al. (2007)	The Center for Alaska Native Health Research (CANHR) Study To determine whether dietary westernization is associated with intake of select nutrients among Alaska Natives living in remote communities; to investigate participant. Characteristics associated with adherence to the traditional Alaska Native diet.	7 remote communities of Western Alaska	241 men and 307 women aged 14-94	Yes – single 24-hour recall	No	Food Utilization	Traditional food are high in nutrient quality and comprised 22% of overall energy intake, though depended on age, educational attainment, and geographic location. The nutrients from those ate higher amounts of a traditional diet contained more vitamin A, vitamin D, vitamin E, iron, and omega-3 fatty acids.
Bersamin et al. (2008)	The Center for Alaska Native Health Research (CANHR) Study To investigate the impact of a Westernizing diet on fat intake, red blood cell fatty acid composition, and health risks.	6 remote communities and 1 town in the Yukon Kuskokwim River Delta, Alaska	230 male and 301 female participants.	Yes – 24-hr recall and a 3 day food from 54% of the participants	No	Food Utilization	Traditional foods positively impact diet quality and promoted cardiovascular health when compared to store bought or 'Western' foods. The amount of traditional foods consumed positively impacted the fatty acid composition of the diet. There was no association between traditional food intake and saturated fatty acid intake.

Table 1.1 Food Security Pillars Matrix continued

Eliat-Adar et al. (2009)	Genetics of Coronary Artery Disease in Alaska Natives (GOCADAN) Stud Evaluate the dietary patterns of Alaska Eskimos and investigate the relations between dietary patterns and known cardiovascular risk factors.	Norton Sound region of Alaska; 7 villages and the town of Nome	Predominantly Inupiat Eskimos, over 18 years, total of 1214 people (537 men and 677 women).	Yes – FFQ from previous year; 97 food items classified into 28 food groups	No	Food Utilization	Traditional foods promote diet quality and decrease cardiovascular disease risk factors and should be encouraged.
Heller & Scott (1967)	The Alaska Dietary Survey: 1956-1961 To determine the present food habits of Alaskan Eskimos and Indians; to estimate the degree of dependence on local food; to estimate the adequacy of the diet/ and to predict medical or public health problems which might arise from inadequate diet.	11 rural villages in Alaska (2 Athapascan and 9 Eskimo)	No specific number of individuals, only total number of diet records: 4840 food records for both sexes and for all age levels.	Yes – diet records of 3-7 day duration; collected on a seasonal basis	No	Food Utilization	Traditional foods provided dietary adequacy in a wide range of nutrients. When compared to recommendations, protein and niacin intake was high and over 75% were low in calcium and ascorbic acid; 1/3 were low in vitamin A and thiamin; ¼ low in riboflavin; extremely high mean intakes of iron.

Table 1.1 Food Security Pillars Matrix continued

Johnson et al. (2009)	The Alaska Native Dietary and Subsistence Food Assessment Project To calculate the energy and nutrient intake in 2 regions in Alaska and to Describe the implications for development of chronic disease among Alaska Native people.	10 villages and 2 hub communities in rural Alaska	333 participants aged 13 – 88 years	Yes – 24 hour recalls during four seasons	No	Food Utilization	High diet quality and nutrient content in traditional foods. Most energy came from store-bought foods but high proportion of nutrients come from traditional foods, notably protein, iron, and omega-3 fatty acids. Average intake of protein, iron, selenium, vitamin A, vitamin C (men) and folate (men) met recommended levels whereas calcium and fiber were below recommendations.
Luick et al. (2014)	The Center for Alaska Native Health Research (CANHR) Study Investigate vitamin D concentrations in relation to demographic and lifestyle variables, particularly with the use of locally harvested foods.	Southwestern Alaska; 6 remote communities and 1 town in the Yukon Kuskokwim River Delta, Alaska	Yup'ik people; 213 men and 284 women, male or non-pregnant female 14 years of age and older.	Yes – 24-hour recall and a subsample with an additional 3-day diet record	No	Food Utilization	There is higher diet quality and nutrient content in traditional foods; the leading source of vitamin D was from local fish (90.1%).

Table 1.1 Food Security Pillars Matrix continued

Nash et al. (2012)	The Center for Alaska Native Health Research study Evaluate isotopic biomarkers of market and traditional food intake in a Yup'ik Eskimo study population.	7 communities from southwest Alaska	Yup'ik people; 315 participants	Yes – 24-hour recall and a 3-day diet record	No	Food Utilization	Aquatic food intake (marine mammals, fish, and seal oil) was reported by 82% and amount of intake increased with age, were higher in coastal communities, and slightly higher in females.
Nobmann et al. (1992)	The diet of Alaska Native Adults: 1987-1988 To determine the eating practices of Alaska Native adults; To understand the role of diet in regards to chronic diseases (heart disease, cancer, and diabetes).	11 communities in Alaska (Kotzebue, Selawik, Mountain Village, Bethel, Kwigillingok, Dillingham, Pilot Point, Pedro Bay, Anchorage, Sitka, and Kake)	351 men and women aged 21-60 years.	Yes – 24-hour recalls during 5 seasons over an 18 month period	No	Food Utilization	There is a high nutrient content in traditional foods; compared to a national sample the average nutrient and energy intake was significantly higher (except for calcium and carbohydrates); the diet met or exceeded RDA for over half participants except in calcium and iron (for women).

Table 1.1 Food Security Pillars Matrix continued

Nobmann et al. (1998)	The Alaska Siberia Project Describe the dietary characteristics important in risk of cardiovascular disease, determine the extent that their diet differs from the diet of the general US and northern populations, Assess how the diet met national guidelines for the prevention of cardiovascular disease, and propose dietary recommendations.	Gambell, Alaska	65 Siberian Yup'ik residents	Yes – 24-hour dietary recall and a semi quantitative FFQ from the past year	No	Food Utilization	The nutrient content in traditional foods is high and when compared to average national intakes 6% higher protein, 5-7% higher in mono fats, 12-15% lower in carbs; the average intakes met recommendations for vitamin E, folacin and vitamin C (men) plus twice the amount of omega-3 fatty acids.
Nobmann & Lanier (2001)	Assess the quality of dietary intakes and compare to current US recommendations.	Anchorage, Alaska	74 Alaska Native adults aged 21-60 years.	Yes – 24-hour recalls (goal of 4)	No	Food Utilization	When comparing participants to recommendations, the average dietary intakes were below for all food groups except meat and beans. Only 27% ate traditional foods at least once in the food recall; decrease in traditional food intake and omega-3 fatty acids were found to increase the risk of cardiovascular disease.

Table 1.1 Food Security Pillars Matrix continued

						Food Access	Migration to urban areas shown to decrease traditional food intake.
Nobmann et al. (2005)	Genetics of Coronary Artery Disease in Alaska Natives (GOCADAN) Study To document Eskimo adults on their usual dietary intakes and sources of selected nutrients and generate appropriate dietary advice to reduce CVD.	Northwest Alaska; 7 villages in the Norton Sound Region	850 Eskimo adults (men and women) aged 17-92 years.	Yes – semi quantitative FFQ	No	Food Utilization	Traditional foods were high in nutrient content and provided high amounts of monounsaturated and polyunsaturated fats.
						Food Access	Younger generations are eating less traditional foods than older generations.
Redwood et al. (2008)	The Education and Research Towards Health (EARTH) Study To determine the prevalence of traditional food and activity use and association with cultural factors.	26 communities within 3 regions of Alaska (Southcentral region, Southeast region, and the Southwest region)	2,323 women and 1,507 men either Alaska Native or American Indian.	Yes – A semi quantitative diet history questionnaire tailored to region	No	Food Access	Food preferences were based on cultural practices and beliefs; 92% ate at least 1 traditional food in the past year; 70% engaged in at least 1 traditional harvesting physical activity; the continued consumption of traditional foods and participation in traditional activities remain important.

Table 1.1 Food Security Pillars Matrix continued

Risica et al. (2005)	The Alaska Siberia Project To add to the knowledge of dietary intake of Alaska Natives of the Bering Straits Region by describing the macronutrient intake of adults.	Bering Straits Region of Alaska	Alaska Native adults; 209 men and 225 non-pregnant women from the Bering Straits Region of Alaska.	Yes – 24-hour dietary recall	No	Food Utilization	The nutrient in traditional foods is high and dietary intake was higher in energy and protein and lower in carbohydrates when compared to a national sample.
Sharma et al. (2015)	The Alaska Native Dietary and Subsistence Food Assessment Project To assess energy and nutrient intake, dietary adequacy, traditional and nontraditional foods consumed, and main foods contributing to energy and selected nutrient intake	6 remote communities in southwestern Alaska, primarily located in Bethel and Wade Hampton census areas	Yup'ik Alaska Native women age 18 and over Who were not pregnant or lactating.	Yes – up to 3 24-hour recalls	No	Food Utilization	The average dietary reference intakes (DRI's) were high for energy and low for dietary fiber, calcium, and vitamins D and E; more than half of The participants fell below the DRI's for vitamin A and more than 1/3 were below for zinc, vitamin C and B6. Traditional foods contributed 34% of protein, 27% of iron, 23% of vitamin A, and 21% of zinc.

Table 1.1 Food Security Pillars Matrix continued

Smith et al. (2008) *Also listed in Quantitative Food Security Articles	The Alaska WIC Healthy Moms Survey To evaluate the impact of including the parent's obesity level as part of the certification nutrition risk for a child using WIC; evaluated food choices which may be of concern for the health of women of childbearing age; the study presents information on the diet, food practices, and community food systems of Alaska women of childbearing age from diverse Native cultural groups.	5 small rural villages and one urban location	122 women: 60 rural and 62 urban Alaska women (64% Alaska Native); over the age of 19 and did not need to be part of the WIC program.

Yes – structured nutrition interviews (24-hour recall and the Block Brief Food Frequency tool)	Yes – doesn't state	Food Access	The rate of food insecurity was 39% in rural and 7% of urban participants. Food sharing and sharing of tools and traditional knowledge in 42% rural and 11% of urban participants.
		Food Utilization	Traditional food intake still occurring in 94% rural and 84% of urban participants and the nutrient content in the traditional foods are high overall - the participants had an adequate intake of protein, low levels of fiber and did not meet the USDA MyPyramid recommendations except for fats, oils, and sweets.

Table 1.1 Food Security Pillars Matrix continued

Quantitative Food Security Articles							
Loring et al. (2013)	Explore the relationship between food security and access to locally caught seafood.	Communities of the Kenai Peninsula region of Alaska	Survey distribution via USPS to 1500 randomly selected households on the Kenai Peninsula; received 490 responses.	No	Yes – 6 question 'coping strategies' questionnaire	Food Access	Local seafood is important to the food system in the region and access to it improves food security; using the copies strategies questionnaire and loosely defined numerical scores to determine food security or insecurity, 27% were food insecure and 39% had a perfect food secure score.
						Food Access	Those of lower income levels rely more sharing, bartering, or trading.
Smith et al. (2008)	*See Quantitative Traditional Food Intake Articles						

Table 1.1 Food Security Pillars Matrix continued

Qualitative Food Security Articles							
Brubaker et al. (2011)	Describe relationships between climate impacts and health effects and provide examples of community-scaled Adaptation actions currently being applied in Northwest Alaska.	12 communities of the Northwest Arctic region of Alaska	None provided – examples of adaptive strategies from two communities (Point Hope & Kivalina) were provided	No	No	Food Utilization	Warming temperatures from climate change is impacting food safety in underground food storage cellars.
Burke et al. (2013)	The goal of the study was to learn more about the experiences of food insecurity in regions of rural Alaska that are accessible by land transportation.	9 communities in rural Southcentral and Southeastern Alaska that are accessible by road, ferry, or both	34 users of food pantries; 85% white, 12% Alaska Native; 68% female.	No	No	Food Access	There is a preference for traditional and cultivated local foods and participants were aware of the nutritional benefits of fresh produce and wild proteins; food sharing and sharing of knowledge, skills and equipment aids in food security.
Fazzino & Loring (2009)	To highlight the geographic and temporal continuity of failed food systems; provide an overview of the food situation in	Fairbanks, Alaska (Fairbanks North-Star Borough)	39 individuals receiving public assistance and food assistance providers; a subset of	No	No	Food Access	Many culturally and place-based identifiers of food shortages were identified, including high food and fuel prices, migration to urban areas, and inadequate equipment to cook and consume foods.

Table 1.1 Food Security Pillars Matrix continued

	Alaska and relate this to trends of rural-urban migration; examine the 'food crisis' in rural and urban Alaska.		responses from Alaska Native peoples were reported.			Food Access	Food assistance programs provided food that participants would not be able to attain.
Flint et al. (2011)	Explored traditional ecological knowledge and scientific aspects of wild berries and the broader context of community health and environmental change.	3 communities; Seldovia, Akutan, and Point Hope	Formal interviews: 11 in Akutan, 24 in Point Hope, and 30 in Seldovia; Surveys: 19 from Akutan, 36 from Point Hope, and 61 from Seldovia.	No	No	Food Utilization	Pick berries: for personal or family food, to be outside or close to nature, to be with family and/or friends, for traditional reasons, for fun, for health or medicinal purposes, or to sell or for employment.
						Food Utilization	Concerns about threats to berry resources: climate change, radioactive contamination, mining, waste disposal or incineration, loss of traditional knowledge, air pollution, soil or water contamination, or over harvesting.

Table 1.1 Food Security Pillars Matrix continued

Hupp et al. (2015)	To identify species of wild berries that were consumed by people in different ecological regions of Alaska and to determine if perceived berry abundance was changing for some species or in some regions.	Throughout Alaska	3 groups of environmental managers surveyed that were knowledgeable about berries and their use; 96 completed surveys from 73 communities.	No	No	Food Availability	Berries were considered very important in communities; for 7 of the 12 berries on the survey the respondents indicated that abundance has declined or become more variable in the past decade.
Loring & Gerlach (2010)	The paper reviews the social and ecological dimensions of salmon management in an effort to understand the differing views of success and competing goals of salmon conservation and food security.	Alaska Native communities along the Yukon River (Marshall, Emmonak, Beaver, Tanana, Chalkyitsik, and Fort Yukon)	25 residents age 40-90 years, mostly men (5 from down-river of Marshall and Emmonak; 20 from the up-river communities)	No	No	Food Access	Results provided the main concerns of residents, including the economic impacts of commercial fishing closures, not having adequate food throughout the winter.
						Food Availability	Changing size of the fish, and changing migration routes of the salmon.

Table 1.1 Food Security Pillars Matrix continued

Magdanz et al. (2011)	Explores patterns and identifies factors associated with changes in fish harvests in project communities; to distinguish changes related to social, economic, and environmental factors from changes related to fisheries management.	6 Northwest Alaska communities: Ambler, Kiana, Kobuk, Noatak, Noorvik, and Shungnak	No specific population; 1994-2004 fish harvests; 92 selected fishing households.	No	No	Food Availability	The harvest trends for the 6 communities show a decline of 2.8% of fish with considerable differences among species; environmental factors such as unusual water levels and weather patterns are affecting the fish harvests
						Food Access	The high costs of fishing are negatively impacting fishing harvests.
McNeeley & Shulski (2011)	Provide a comprehensive picture of vulnerability to recent warming trends	Koyukuk-Middle Yukon region of Interior Alaska	No specific population	No	No	Food Availability	A shift in seasonality has negative effects on communities, including weather and less access to hunting areas due to changes in water levels; warmer weather and changing moose mating/ hunting timing.
						Food Utilization	Unseasonably warm temperatures and length of time to transport and process the moose is causing spoilage

Types of Research

Studies within the systematic review were categorized into 3 main types of research: those that quantified traditional food intake (n=19), those that quantified food security (n=2; 1 of which is also included in research that quantified traditional food intake), and qualitative articles that addressed at least 1 pillar of food security (n=8). The 3 categories were used to evaluate how traditional foods relate to the pillars of food security in Alaska and to determine future research needs.

Research that quantified traditional foods focused on understanding how traditional foods contribute to nutrient intake or diet quality. A majority (n=14) of the studies found that people who consumed traditional foods had higher intakes of a number of important nutrients, including protein, omega-3 fatty acids, and iron. Several articles also compared the dietary intake of those who consumed traditional foods against a national sample or with national recommendations. Many studies (n=9) found that traditional foods help to meet these recommendations, especially for energy, protein, and fat intake. These studies also found that recommendations were not met for other key nutrients, including calcium and fiber (Bartell, Nobmann, & Ponce, 1999; Heller & Scott, 1967; Johnson, Nobmann, Asay, & Lanier, 2009; Nobmann, Byers, Lanier, Hankin, & Jackson, 1992).

There were 2 papers that quantified food security, though neither measured food security using the USDA's Food Security Survey Module. One formulated a "coping strategies" questionnaire to measure food security and the other paper did not state the tool used to measure food security. The studies found varying food insecurity rates, with 7% to 27% in urban settings, and 39% in rural settings (Loring, Gerlach, & Harrison, 2013; Smith, Johnson, Easton, Wiedman, & Widmark, 2008).

An accumulation of 8 qualitative studies examined peoples' observations or perspectives on factors impacting food security. Participants identified several factors ranging from climate change (Brubaker, Berner, Chavan, & Warren, 2011; Flint et al., 2011), to concerns about contamination in the traditional food supply (Flint et al., 2011), and changing migration patterns

of traditional resources (Loring & Gerlach, 2010b; McNeeley & Shulski, 2011). Additional factors included high equipment and fuel prices (Fazzino & Loring, 2009; Magdanz et al., 2011) and a loss of traditional knowledge (Flint et al., 2011).

Geographic Location

Research on traditional food intake was broadly distributed across the state, including both urban and rural locations. Of the 19 articles, 1 was conducted exclusively in an urban area (Nobmann & Lanier, 2001) and 2 others in both urban and rural areas (Redwood et al., 2008; Smith et al., 2008). The remaining 16 were conducted in rural communities. Participants who were interviewed came from communities of different sizes and locations that were both accessible and not accessible to the road system. See Table 1.1, under quantitative traditional food intake articles, for a listing of geographic locations.

The 2 articles quantifying food security were conducted in an urban area (population ~ 55, 000) and within both an urban (population ~ 250,000) and rural areas, respectively (Loring et al., 2013; Smith et al, 2008). No studies were found that measured food security in rural areas where food insecurity has been reported to be the highest (Feeding America, 2015). See Table 1.1, under quantitative food security articles, for a listing of geographic locations.

Of the 8 qualitative food security studies, 1 was conducted in an urban area (Fazzino & Loring, 2009) and the remaining were conducted in rural communities. Though interviews were conducted in a variety of rural communities, no studies conducting qualitative food security research in the largest urban area in the state were identified in this review. See Table 1.1, under qualitative food security articles, for a listing of geographic locations.

Study Population

The study population in the systematic review included a range of ages and ethnic groups. Each of the studies collected dietary data from participants at least 13 years of age or older and both men and women, though 3 papers did not specify the age ranges. The ethnicity of

participants varied among the quantitative traditional food studies as well. Many of the papers did not identify the ethnicity of participants, though participants came primarily from Alaska Native communities.

The 2 quantitative food security articles had different study populations. One study included non-pregnant and non-breastfeeding adult women (Smith et al., 2008) and the other included both women and men recruited from a random sample of households (Loring et al., 2013).

The 8 qualitative food security articles had varied study populations, and 2 included interviews from public food assistance users of varying ethnicities (Burke et al., 2013; Fazzino & Loring, 2009). There were 2 additional papers that interviewed participants from mainly Alaska Native communities across the state (Flint et al., 2011; Loring & Gerlach, 2010b). One article interviewed environmental managers without mention of their ethnicities (Hupp, Brubaker, Wilkinson, & Williamson, 2015), and the last 3 articles did not specify the population interviewed (Brubaker et al., 2011; Magdanz et al., 2011; McNeeley & Shulski, 2011). See Table 1.1 for a listing of the study population within each article.

Traditional Food Availability

A total of 4 qualitative food security articles addressed the availability of traditional foods. In particular, the studies found that climate change may limit the availability of traditional foods. For example, a change in the climate and warmer temperatures has affected mating and hunting timing (McNeeley & Shulski, 2011) and a change in the availability and migration patterns of some fish species (Loring & Gerlach, 2010b; Magdanz et al., 2011). Additionally, it was observed that the abundance of berries has declined or become more variable in the past decade (Hupp et al., 2015). No studies that quantified traditional foods or food security addressed traditional food availability. See Table 1.1 for a listing of articles that addressed traditional food availability.

Traditional Food Access

A total of 15 articles looked at traditional food access, concluding that traditional foods are less readily accessible in urban areas where a majority of the indigenous population are living (Ballew et al., 2004; Nobmann & Lanier, 2001) and there is less of a preference for these foods, especially among younger generations (Nobmann et al., 2005). Both the qualitative and quantitative food security articles show that access to traditional foods, in either urban or rural areas, is increased when individuals share or trade traditional knowledge to harvest and prepare traditional foods, share the equipment needed to attain the foods, or share or trade the actual foods (Burke et al., 2013; Fazzino & Loring, 2009; Loring et al., 2013; Smith et al., 2008). Several of the articles mentioned that access to traditional foods requires consideration of costs of hunting and fishing equipment and fuel needed for transportation to hunt, fish, or gather (Fazzino & Loring, 2009; Magdanz et al., 2011). See Table 1.1 for a listing of articles that included traditional food access.

Traditional Food Utilization

A collection of 20 articles looked at traditional food utilization. There were 2 qualitative food security studies that looked at factors that cause traditional food spoilage or food-borne illness. One reported that climate change and warming temperatures are causing underground food storage cellars to thaw and cause subsequent food safety issues (Brubaker et al., 2011). The second article indicated that traditional foods are spoiling due to the length of time required to go from the changing migration grounds, which are farther away, to the processing locations (McNeeley & Shulski, 2011). See Table 1.1 for a listing of articles that included traditional food utilization.

The majority of the research (n=14) focused on the nutrient quality and health benefits of traditional foods. Nutrients including protein, vitamin A, most B vitamins, vitamin C, vitamin D, vitamin E, phosphorus, iron, niacin, selenium, and omega-3 fatty acids are high in many diets of individuals consuming high amounts of traditional foods (Ballew et al., 2006; Bersamin et al., 2007; Heller & Scott, 1967; Johnson et al., 2009; Luick, Bersamin, & Stern, 2014; Nobmann et

al., 2005; Risica, Nobmann, Caulfield, Schraer, & Ebbesson, 2005; Sharma, Mead, Simeon, Ferguson, & Kolahdooz, 2015; Smith et al., 2008). The amount of traditional foods consumed, however, varied by age, education, and geographic location in the study populations (Bersamin et al., 2007; Nash et al., 2012; Nobmann et al., 2005). Bersamin et al. (2006) found that traditional foods contribute to diet quality as measured by the Healthy Eating Index – a person's diet quality is higher when traditional foods are consumed. Additionally, several articles concluded that traditional foods promote cardiovascular health (Bersamin, Luick, King, Stern, & Zidenberg-Cherr, 2008; Eliat-Adar, Mete, Nobmann, Xu, Fabsitz, Ebbesson, & Howard, 2009; Nobmann & Lanier, 2001; Nobmann et al., 2005) and a lower prevalence of glucose intolerance (Johnson et al., 2009).

1.5 Discussion

Food security research in Alaska is very limited, with only 28 studies either quantifying traditional food intake or food security, or conducting qualitative food security research on at least 1 pillar of food security. In a state where 14% of the overall population, 19% of the Alaska Native population, and 20-25% of rural communities are experiencing food insecurity (Alaska Department of Health and Social Services, 2015; Feeding America, 2015), research is lacking to understand its causes and consequences. Of the 28 studies, only 2 actually quantified food security with 1 also quantifying traditional food intake. Many Alaska Native peoples continue to consume a wide variety of traditional foods and these foods make up 15-22% of the diet in some rural communities (Ballew et al., 2006; Bersamin et al., 2007; Nobmann et al., 2005). It is unknown whether traditional foods are central to their food security since the role of traditional foods is still poorly understood in its relationship with food security.

Traditional foods are an important source of essential nutrients in rural Alaska Native communities. Consistent with research conducted in the Canadian Arctic, people who consume higher levels of traditional foods have higher intakes of protein, vitamin D, iron, omega-3 fatty acids, and other vitamins and minerals; thus, suggesting that traditional foods are essential to maintaining adequate nutrition as well as food security (Ford & Berrang-Ford, 2009). This is not surprising given that the food system in rural Alaska Native communities is dependent on both

traditional foods and food imports, and imported food can be unreliable because of air or other transportation services that are impacted by environmental conditions.

Today, more than half of Alaska Native people live in urban centers where availability of store-bought foods is much greater and the availability of traditional foods is much lower (Alaska Department of Fish and Game, 2015). The increase of store-bought foods has been shown to decrease nutrient and diet quality and increase the potential for chronic diseases, such as obesity, diabetes, and heart disease in both Alaska and the circumpolar north (Bersamin et al., 2007; Bjerregaard & Mulvad, 2012; Huet, Rosol, & Egeland, 2012; Egeland, Johnson-Down, Cao, Sheikh, & Weiler, 2011). Conversely an increase of traditional foods has been associated with better health outcomes such as improved glucose tolerance and lipid profiles (Johnson, Nobmann, & Asay, 2012), lower risk of cardiovascular disease (Nobmann et al., 1992), and an increase of diet quality (Kuhnlein & Receveur, 1996; Kuhnlein & Receveur, 2007). To our knowledge, no studies have investigated the contribution of traditional foods to food security in urban areas, save Fazzino and Loring (2009) who focus specifically on the experiences of food bank users who have recently moved to urban areas from rural communities. It is important to understand how traditional foods contribute to food security since they continue to be culturally relevant, provide nutrient and diet quality, and improve the health of individuals. Determining the role traditional foods play for those living in urban communities will allow for advancement in policy to increase availability and access of these foods in urban areas and strengthen the food system of indigenous populations within the state (Ford & Berrang-Ford, 2009).

What we know about traditional food security in Alaska comes from few research studies. Of the research found, each had different methods and objectives, making it difficult to acquire a comprehensive review of factors that influence access, availability, and utilization of traditional foods. Factors that appear to influence traditional food availability and access include climate change, food sharing, living in urban areas, costs associated with following a traditional lifestyle, and changing food preferences. Additional research about traditional food security in the circumpolar north can help provide additional insights since the area has similarities in its extreme climate, limited infrastructure, and indigenous populations. There seem to be many factors in the circumpolar north that are impacting traditional food availability and access. Some

factors relate to differing species or hunting locations, including changing migration patterns (Guyot et al., 2006) and regulations on wildlife management (Goldhar, Ford, & Berrang-Ford, 2010). Other factors are related to the environment and climate change, ranging from a rise in sea levels from melting ice caps and glaciers (Nancarrow & Chan, 2010) to thawing permafrost (Guyot et al., 2006) and changing weather and winds (Wakegijig, Osborne, Statham, & Issaluk, 2013).

Currently surveillance data in Alaska uses the USDA Food Security Survey Module, a tool used to estimate the prevalence and severity of food insecurity (United States Department of Agriculture, 2015). However, this tool does not take into account the availability and access of food derived from northern environments. This standard survey may not be appropriate to capture the unique situation of the indigenous populations in Alaska due to traditional food preferences or the seasonal nature of the regional foods system (Gerlach & Loring, 2013); others have recommended that the survey be modified to include traditional foods (Power, 2008). Although some surveys have been developed that asks about traditional foods and food security, no one tool has been used consistently that takes traditional foods and traditional lifestyles into consideration. A common tool for use with indigenous populations and in rural Alaska Native communities would allow for future research to be compared and provide a more comprehensive understanding of the local causes and consequences of traditional food security in Alaska.

1.6 Conclusion

There is a lack of meaningful research investigating food security issues in Alaska. In a state with vast geographical areas and extreme weather conditions, many rural Alaska Native communities and urban-dwelling Alaska Native individuals face challenges attaining adequate, safe, and culturally appropriate foods. To further understand the causes and consequences of traditional food insecurity in Alaska, and to increase all of the efforts necessary to promote traditional food security, working with and across disciplines will be necessary. Examples include working with legislators to write and pass applicable laws to promote traditional food security and developing culturally-appropriate nutrition education to promote traditional foods for those receiving food and nutrition assistance.

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Chapter 2 Traditional Food Practices, Attitudes, and Beliefs in Alaska Native Women Receiving WIC Assistance[1]

2.1 Abstract

Traditional foods are often considered essential to the health, well-being, and security of Alaska Native peoples. Traditional foods are an important source of high quality nutrients and they contribute to people's sense of personal and cultural identity. The objective of the research is to examine the association between practices, attitudes, and beliefs around traditional food and intake of traditional foods among low income Alaska Native women living in an urban center who are receiving WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) assistance. The cross-sectional study uses data from interviewer-administered surveys, 24-hour dietary recalls, and a traditional food frequency questionnaire (FFQ). A convenience sample of 71 low income Alaska Native women receiving WIC food and nutrition assistance was recruited from two WIC clinics in Anchorage, Alaska. Using quantitative data from participants' average daily traditional food intake, along with qualitative information on their practices, attitudes, and beliefs about traditional foods, correlation statistics and linear regression was run to determine associations. The average intake of traditional foods was 3.7% of total daily calories, with a range of 0.1-14.7%. Participants' opinions were mixed on the costs and availability of traditional foods and a clear majority (64.4%) thought traditional foods are healthier than store bought foods. Women typically relied on food sharing networks to access traditional foods. Linear regression models indicated that participants who ate more traditional foods were more likely to have traveled to a rural Alaska Native community in the past year ($p=.001$) and had a preference for traditional foods over store-bought foods ($p=.002$). Participants also were found to rely on food sharing networks for traditional foods and acquire little themselves. The results highlight the importance of enhancing social networks in food and nutrition assistance programs and more culturally relevant food policy support made available

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for urban Alaska Native women seeking to increase their traditional food intake. These findings can assist nutrition educators to provide culturally relevant counseling to Alaska Native WIC participants aimed at increasing traditional food intake. They also inform contemporary understandings of the nutrition transition and how it is playing out for urban Alaska Natives.

2.2 Introduction

Traditional foods are often considered essential to the health, well-being, and security of Alaska Native peoples. With respect to diet and nutrition, traditional foods are an important source of high quality and nutritious foods. The specific traditional foods harvested vary by geographic area; in general, they include land and marine mammals, fish and other seafood, and plants such as seaweed, blueberries, and salmonberries, and all make substantive contributions to people's dietary needs. People who consume more traditional foods have higher intakes of vitamins A, C, D, and E, protein, phosphorus, iron, niacin, selenium, and omega-3 fatty acids (Ballew, Tzilkowski, Hamrick, & Nobmann, 2006; Bersamin, Zidenberg-Cherr, Stern, & Luick, 2007; Johnson, Nobmann, Asay, & Lanier, 2009; Risica, Nobmann, Caulfield, Schraer, & Ebbesson, 2005; Sharma, Mead, Simeon, Ferguson, & Kolahdooz, 2015) and have higher overall diet quality (Bersamin et al., 2007; Kuhnlein & Receveur, 2007). The practices (e.g., physical activity) associated with hunting, fishing, and gathering of traditional foods also provides benefits beyond nutrition for Alaska Native peoples.

Traditional foods are likewise important to Alaska Native people's psychological and psychosocial health; they contribute to people's sense of personal and cultural identity, to their practice and maintenance of traditions, and they also provide a basis for shared social activity and cohesion (Damman, Wenche, & Kuhnlein, 2007; Duhaime, Chabot, & Gaudreault, 2002; Inuit Circumpolar Council Alaska, 2015; Kuhnlein & Receveur, 1996; Loring & Gerlach, 2009; O'Keeffe & Reimer, 2010; Power, 2008; Willows, 2005). Some elders state that traditional foods are the manifestation between the spiritual and cultural ties of individuals, the community, and the land (Smith, Johnson, Easton, Wiedman, & Widmark, 2008). Likewise, research has shown that many Alaska Native peoples derive self-worth both individually and collectively from traditions associated with these foods and practices (Graves, 2004; Hazel & Mohatt, 2001; O'Keeffe & Reimer, 2010).

Traditional foods also play an important role in supporting household and community food security (Caulfield, 2002; Inuit Circumpolar Council Alaska, 2015; Loring & Gerlach, 2009). Alaska Native peoples over the years have relied on a diverse portfolio of traditional food

options that confers resilience during times of stress (Binford, 2002; Kofinas et al., 2010; Loring & Gerlach, 2010; Nelson, 1969; Nelson, 1986). Today, traditional foods also represent a basis by which Alaska Native peoples are revitalizing culture, forging for themselves a path into the modern world, and mounting resistance to such global challenges as climate change (BurnSilver, Magdanz, Stotts, Berman, & Kofinas, 2016; Inuit Circumpolar Council Alaska, 2015).

Despite these many reasons that traditional foods are of great importance to Alaska Native peoples, consumption today is notably reduced from even 30 years ago (Caulfield, 2002; Kuhnlein et al., 2004). Intake of traditional foods in Alaska has been estimated in a number of studies, the majority of which have been conducted in rural Alaska Native communities (Loring & Gerlach, 2015). As of the early 2000s, research showed that on average, rural Alaska Native people consume between 15 and 22% of their diet from traditional food (Ballew et al., 2006; Bersamin et al., 2007; Nobmann et al., 2005). This estimate varies by age, whereby older people typically consume more traditional foods than younger people (Bersamin et al., 2007; Nobmann et al., 2005), and geographic location whereby the intake in coastal villages is typically higher than in interior villages (Nash et al., 2011). There is little information about traditional food intake in urban communities, where today more than half of the state's Alaska Native people live (State of Alaska, 2015), though urban Alaska Native peoples still seek out these foods (Fazzino & Loring, 2009). Data from the Alaska Department of Fish and Game estimates that 23 pounds of traditional foods are harvested per person annually in urban areas, nearly 93% less than those living in rural areas (Wolfe, 2004), suggesting that traditional food intake among Alaska Native people in urban areas is likely low.

Low income Alaska Native women are particularly vulnerable to food insecurity and poor diet quality (Food and Agriculture Organization, 2015; Ivers & Cullen, 2011; Maxwell, 1996; Tarasuk, 2005; Willows, Veugelers, Raine, & Kuhle, 2009). Vulnerability may be even higher among low income Alaska Native women living in urban areas, where availability and access to traditional foods is limited (Ballew et al., 2004; Fazzino & Loring 2009; Nobmann & Lanier, 2001). Some research has shown that access to traditional foods bolsters food security for low income peoples in urban areas (Loring, Gerlach, & Harrison, 2013). Our objective was to examine factors that may be associated with intake of traditional foods among low income urban

Alaska Native women receiving WIC assistance. Findings from this study can guide decision making among policy makers, educators, and other key stakeholders in their efforts to increase access to and intake of traditional food and thereby promote health and food security of Alaska Native women living in urban centers.

2.3 Methods

Study Design

Research participants were recruited from two WIC (Special Supplemental Nutrition Program for Women, Infants and Children) offices in an urban center in Alaska between September 2014 and June 2015. Inclusion criteria included participation in the WIC food assistance program, self-identification as Alaska Native, being 18 years old or older, and not pregnant or breastfeeding. Interviews were conducted on site by the first author and a research assistant and took approximately one hour to complete. Participants completed one 24-hour dietary recall, a traditional food frequency questionnaire (FFQ), and a survey that assessed practices, attitudes, and beliefs around traditional foods. A second 24-hour dietary recall was collected over the phone within one week of the initial interview.

Ethical Approval of Human Subjects and Consent

The research was approved by the University of Alaska Fairbanks and the Alaska Area Institutional Review Boards. Concept approval was obtained from Southcentral Foundation, and the study was approved by the Alaska Native Tribal Health Consortium (2.8 Appendix). Participants received prepaid gift cards to a grocery store as compensation for completing all surveys.

Dietary Assessment

Diet was assessed using two interviewer administered 24-hour dietary recalls and a traditional food FFQ. Diet data were collected from each participant by certified interviewers

using a computer assisted 24-hour dietary recall (Nutrition Data System for Research [NDS-R], software version 2014, Regents of the University of Minnesota, Minneapolis). The software was selected because its database includes many unique Alaska Native foods. Participants were asked to recall all food and beverages consumed over a 24-hour period using a multiple-pass approach that is built into the software to minimize recall bias.

The FFQ was designed to estimate participants' annual consumption of traditional foods and included 176 traditional foods. To estimate average daily intake of traditional foods, data from the FFQ were entered into the NDS-R software and estimates were divided by 365 days. To estimate percent calories from traditional foods, average daily traditional food intake was divided by average calories consumed as estimated from the 24-hour recalls.

An interviewer guide was developed to standardize data collection, providing coding rules and definitions for commonly used words within the FFQ. A traditional food resource guide was also available for traditional food pictures and descriptions, and a serving size booklet aided participants in estimating their food portion sizes.

Traditional Food Survey

Practices, attitudes, and beliefs about traditional foods were assessed using a 13-question traditional food survey. The survey was informed by a review of the literature looking at factors that influence traditional food intake and discussions with stakeholders that represented nutrition educators in the WIC program and food security experts in Alaska. The survey assessed participation in food sharing networks, preference for traditional foods, having a hunter or fisherman in the home, the economic value of traditional foods, the healthfulness of traditional foods, and whether money was an issue in obtaining these foods. Previous studies have shown that these factors are related to access to and intake of traditional foods (Ballew et al., 2004; Burke, Durr, & Alaska Food Coalition, 2013; Magdanz, Smith, Braem, Fox, & Koster, 2011; Redwood et al., 2008; Smith et al., 2008). The survey was pilot tested with 10 individuals, including nutrition educators, WIC staff, food security experts, and the target population.

Feedback about wording, readability, cultural appropriateness, and question flow were incorporated into the final surveys.

Statistical Analysis

All data analysis was performed using SPSS software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). All statistical significance was defined as P <= 0.05. Analyses included descriptive frequencies to determine participant demographic characteristics, including age, marital status, education, and income level. Finally, multiple linear regression was used to determine associations between traditional food intake and variables of interest.

2.4 Results

The majority of participants in the study were between the ages of 18 – 39 years (88%), were single (61.5%), had no college experience (64%), and had an annual income of less than $25,000 (68.5%). In fact, almost half (46.5%) had an annual income of less than $10,000 (Table 2.1). Additionally 42% had lived in a rural Alaska Native community for 11 years or longer. A majority of participants stated they followed a traditional way of life (characterized by activities such as sharing, helping one another in the community, taking part in subsistence activities, and eating traditional foods; Wolsko, Lardon, Hopkins, & Ruppert, 2006) either somewhat (70%) or a lot (11%), though many also stated they follow a Western way of life either somewhat (35.6%) or a lot (61.6%). On average participants consumed 1950 calories (SD +/- 818 calories) each day and approximately 3.7% (SD +/- 3.3%) of those calories came from traditional foods.

Table 2.1 Socioeconomic and Lifestyle Characteristics of Participants (n=73)

Characteristic	**Number**	**Percent**
Age		
18-29 years	33	45.2%
30-39 years	31	42.5%

Table 2.1 Socioeconomic and Lifestyle Characteristics of Participants (n=73) continued

40+ years	9	12.3%
Marital Status		
Married	16	22%
Divorced/Separated	8	11%
Single	45	61.5%
Other	4	5.5%
Education		
Less than 12 years	16	22%
High school graduate or GED	31	42.5%
Some college	9	12.5%
Technical training or Associates	16	22%
Bachelor's degree	1	1%
Annual Income		
Less than $10,000	34	46.5%
$10,000-24,999	16	22%
$25,000-44,999	9	12.3%
$45,000-64,999	3	4.1%
Don't know or refused	11	15.1%
Years lived in rural AK community		
Less than one year	10	13.5%
1-5 years	9	12%
6-10 years	7	9.5%
11-15 years	6	8%
16+ years	25	34%
Unknown	16	22%
Follow a traditional way of life		
A lot	8	11%
Some	51	70%
Not at all	13	17.8%

Table 2.1 Socioeconomic and Lifestyle Characteristics of Participants (n=73) continued

Don't know	1	1.4%
Follow a Western way of life		
A lot	45	61.6%
Some	26	35.6%
Not at all	2	2.7%
	Range	Average
Dietary Intake	965-3405 kcals/day	1950 kcals
Traditional Food Intake	0.1% - 14.7%	3.7%

A majority of participants had family or friends in rural Alaska (93.2%) and approximately two-thirds (65.8%) received traditional foods from them (Table 2.2). Participants also indicated that they, or someone in their home, either gathered, hunted, or fished for food (65.8%). When asked where/from whom participants received the most traditional foods, results indicated that sharing was most common (72.6%) followed by harvesting traditional foods themselves (15%). Given a choice, approximately 25% of participants indicated that they would prefer to consume mostly or only traditional foods while more than a third (37%) indicated that they would prefer to consume mostly or only store-bought foods. The majority of participants (64.4%) believe that traditional foods are healthier than store bought foods. Nearly half of the participants (46.6%) indicated that it costs more for them to get store bought foods than traditional foods, although a significant minority of the participants (20.5%) indicated that traditional foods were more costly than store bought foods. Sixty percent of participants either somewhat or strongly agreed that '*the lack of money for subsistence hunting or fishing keeps me from getting all the traditional foods I want*', while only 17.8% either somewhat or strongly disagreed.

Table 2.2 Traditional Food Acquisition, Practices, Attitudes and Beliefs (n=73)

Characteristics	**Number**	**Percent**
Family or friends in rural Alaska (yes)	68	93.2%
Receive traditional foods from family or friends in rural	48	65.8%

Table 2.2 Traditional Food Acquisition, Practices, Attitudes and Beliefs (n=73) continued

Alaska (yes)		
Do you or someone in your home gather, hunt, or fish for food? (yes)	48	65.8%
From whom or where do you get the most traditional foods?		
Shared	53	72.6%
Self	11	15%
Grocery store	6	8.2%
Barter or trade	2	2.7%
Hunter or fisherman	1	1.4%
Traditional food preference (if I had a choice I would eat)		
Only traditional foods and little to no store bought foods	4	5.5%
Mostly traditional foods and some store bought foods	14	19.2%
About the same amount of traditional and store bought foods	28	38.4%
Mostly store bought foods and some traditional foods	24	32.9%
Only store bought foods and little to no traditional foods	3	4.1%
Which of the following do you most generally agree with?		
It costs more for me to get traditional foods than store bought foods	15	20.5%
It costs the same for me to get traditional and store bought foods	7	9.6%
It costs more for me to get store bought foods than traditional foods	34	46.6%
Unknown if store bought or traditional foods cost more	17	23.3%
Which of the following do you generally believe?		
Traditional foods are healthier than store bought foods	47	64.4%

Table 2.2 Traditional Food Acquisition, Practices, Attitudes and Beliefs (n=73) continued

Traditional foods and store bought foods are equally healthy	19	26%
Store bought foods are healthier than traditional foods	2	2.7%
Unknown if store bought or traditional foods are healthier	5	7%
How much do you agree with the statement 'The lack of money for subsistence hunting or fishing keeps me from getting all the traditional foods I want'		
Strongly agree	27	37%
Somewhat agree	17	23.3%
Somewhat disagree	8	11%
Strongly disagree	5	6.8%
Don't know	16	22%

An open-ended question asked participants if there were other difficulties getting or eating all the traditional foods they wanted. A total of 45 responses were recorded. The most common response was the extra expenses associated with obtaining traditional foods (n=10). The remaining responses included living in an urban area (n=8), a lack of transportation to go hunting, fishing, or gathering (n=5), the need to work or lack of time due to working (n=5), restrictions due to licenses or laws (n=4), family commitments (n=4), not knowing how to hunt or fish (n=3), a general lack of availability of traditional foods (n=2), competing with non-natives (n=2), and environmental changes (n=1).

Linear regression was run to determine any factors that were associated with traditional food intake, with covariates controlling for age, marital status (dichotomized as being married or not being married), number of members in the household, and income. Results indicated that participants who ate more traditional foods were more likely to have traveled to a rural Alaska Native community in the past year ($B = .029$, $p < .001$) and have a preference for traditional foods over store-bought foods ($B = .009$, $p < .004$). Multiple linear regression revealed an R^2 value of 0.279. Table 2.3 shows the results of the linear regression model.

Table 2.3 Multiple Linear Regression Predicting Traditional Food Intake

Model	β	B	SE	p-value
Age	.023	9.363^{-5}	.000	.840
Marital Status	-.042	-.001	.002	.719
Number of members in the household	.122	.002	.002	.305
Income	.239	.005	.002	.063
Traveled to rural Alaska Native community in past year	.336	.029	.009	.001*
Preference for traditional foods	.272	.009	.004	.020*

β = standardized coefficient; B = unstandardized coefficient; SE = standard error

*Significance determined at p-value <= .05

2.5 Discussion

Findings from our study provide a current estimate of traditional food intake from a sample of low income Alaska Native women living in the largest urban area in Alaska and receiving WIC assistance. Our results show that traditional food intake may be even lower than previously documented in urban areas (Nobmann & Lanier, 2001). This is of concern because low traditional food intake can negatively impact food security, diet quality, and health. We also found that women rely on food sharing networks for traditional foods and acquire little themselves. Women who preferred traditional food and who had a network in rural Alaska were more likely to consume these foods.

Our research found that traditional foods made up 3.7% of the overall energy intake of the participants' diet, which is less than half of estimates from rural Alaskan communities that range from 15-22% (Ballew et al., 2006; Bersamin et al., 2007; Nobmann et al., 2005). Only three research studies estimated traditional food intake in urban areas, however, it is difficult to compare findings because of differing methodologies. Nobmann and Lanier (2001) found that only 27% of participants consumed traditional foods at least once over the dietary recall period,

whereas the Education and Research Towards Health (EARTH) study found 92% of the participants had consumed traditional foods at least once in the past year (Redwood et al., 2008), and Smith et al. (2008) concluded that traditional food intake was being consumed regularly in 84% of urban participants.

Food sharing networks in this study were the most common means of obtaining traditional foods, though only 15% of participants secured these foods on their own. Participants expressed that the lack of transportation, time, and knowledge to gather, hunt, or fish as major barriers to consuming more traditional foods. In additional the costs involved with obtaining such foods was a barrier. Given that the majority of the participants are single mothers who lack resources such as money and time, these results are not surprising. The results, however, highlight the importance of enhancing social networks for those participating in food and nutrition assistance programs or outreach opportunities for local food policy councils.

Low income Alaska Native women receiving WIC assistance recognize the healthfulness of traditional foods and those who have a preference for traditional foods are more likely to consume them. This creates an opportunity for federal nutrition education programs to tailor their messages to highlight the benefits of traditional foods. By improving the attitudes and beliefs around traditional foods, low income women may prioritize consuming these foods. Options to improve attitudes and beliefs could include cooking demonstrations or taste tests, distributing cookbooks, and workshops to increase awareness and competence of processing or storing traditional foods. Actual intake, however, is contingent upon policies that improve access. Policy changes at the state and federal level will need to address hunting and fishing regulations, foods allowable for purchase in food and nutrition assistance programs, and regulations for processing of additional traditional foods.

These data also add resolution to ongoing debates about how modernization and the so-called nutrition transition are playing out for Alaska Native peoples. One recent study suggests for example that some rural communities have reached a point of stability with the cash and traditional food components of their livelihoods and economies, as opposed to continuing to progress towards a cash-only economy (BurnSilver et al., 2016). Yet, this study makes no

mention of the issue of rural outmigration to urban areas, which is ubiquitous in rural Alaska and dominated by young women (Hamilton & Seyfrit, 1994; Hamilton, Lammers, Glidden, and Saitto, 2014). These women and their experiences contradict the picture of stability suggested by Burnsilver and colleagues, and ought not be overlooked in our understanding of the ongoing transitions that Alaska Native peoples are experiencing, whether in rural or urban places.

There were some limitations in the research. Traditional foods are infrequently consumed foods and are notoriously difficult to assess with standard dietary assessment methods. It is difficult to know how these methods impacted our estimates, however, given that FFQ's typically overestimate foods consumed (Willett, 2013). It does not, however, impact our overall results or key findings since intake was very low. Self-report is also a limitation, although it is generally recognized as unavoidable in this kind of dietary study. Additionally the small sample size and nonrandom nature of the study means that results may not be generalizable to a larger population and may not detect all relevant associations (Button et al., 2013). A larger sample size may be able to more fully address other factors that impact traditional food intake.

2.6 Conclusion

Overall, limited access appears to be the largest barrier to consuming traditional foods and addressing low intake is unlikely to be resolved without strong policies in place. Expanding the Supplemental Nutrition Assistance Program (SNAP) to allow additional Alaska communities to purchase items for subsistence hunting and fishing (State of Alaska, 2015) and changing WIC regulations to include traditional foods for purchase are two possible immediate policy recommendations. Working with an organization such as the Alaska Federation of Natives, whose mission is to enhance and promote the cultural, economic and political voice of the entire Alaska Native community, and prioritizing initiatives is an important place to begin (Alaska Federation of Natives, 2016).

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2.8 Appendix

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Institutional Review Board
909 N Koyukuk Dr. Suite 212, P.O. Box 757270, Fairbanks, Alaska 99775-7270

October 4, 2013

To: Andrea Bersamin, PhD
Principal Investigator

From: University of Alaska Fairbanks IRB

Re: [518629-1] Traditional food security and diet quality for urban Alaska Native women

Thank you for submitting the New Project referenced below. The submission was handled by Exempt Review. The Office of Research Integrity has determined that the proposed research qualifies for exemption from the requirements of 45 CFR 46. This exemption does not waive the researchers' responsibility to adhere to basic ethical principles for the responsible conduct of research and discipline specific professional standards.

Title:	Traditional food security and diet quality for urban Alaska Native women
Received:	October 2, 2013
Exemption Category:	2
Effective Date:	October 4, 2013

This action is included on the November 6, 2013 IRB Agenda.

A very well done package with no modifications needed, and with no perceivable threats to research personnel or respondants; however, here are some*suggestions*:

Demographics Questionnaire:

All Alaska Native groups except Athabascans denoted separately, though Alutiiq (Alutiit/Sugpiat) and Eyak are not metioned at all. Diacritical marks used, but not on Iñupiat(q). Siberian Yup'ik people call themselves *Yuit*. No requirement to change, but might consider it.

All questionnaires:

Most questions have "refused" option; suggestion that this be made evident (orally or writen) that this applies to *every* question.

Traditional Food FFQ question 7:

Hooligan (Eulachon) grease is consumed frequently and is culturally important, especially in SE/SC AK--may want to consider adding this option to question 7. If you choose to make this change please submit your modified questions in IRBNet.

Southcentral Foundation

February 11, 2014

Andrea Bersamin, PhD
PO Box 757000
Fairbanks, AK 99775
Phone: (907)474-6129
E-mail: abersamin@alaska.edu

Dear Dr. Bersamin:

Your concept proposal 'Traditional food security and diet quality for urban Alaska Native women' has been approved by the Southcentral Foundation (SCF) Executive Committee on February 11, 2014.

This indicates permission from SCF to develop and submit a full research proposal to the Alaska Area Institutional Review Board and funding agency (as applicable).

Please follow the instructions provided by the Alaska Area Institutional Review Board notifying you of the next step in the review process. Once Institutional Review Board approval is received, please re-contact the SCF Research Department to begin the tribal review approval process for the full proposal.

If you have any questions, please contact the SCF Research Department at 907-729-3623 or scfresearchreview@scf.cc.

Sincerely yours,

SOUTHCENTRAL FOUNDATION

Denise Dillard, Ph.D.
Director of Research

Alaska Area Institutional Review Board

4315 Diplomacy Drive - RMCC
Anchorage, AK 99508
Phone: (907) 729-3924

DATE: April 29, 2014

TO: Andrea Bersamin, PhD
Principal Investigator
Amanda Walch
University of Alaska Fairbanks
PO Box 75700
Fairbanks, Alaska 99775

FROM: Alaska Area Institutional Review Board (IHS IRB #2)

STUDY TITLE: [518629-3] Traditional food security and diet quality for urban Alaska Native women
IRB REFERENCE #: 2013-12-035
SUBMISSION TYPE: New Project

ACTION: APPROVED
APPROVAL DATE: April 23, 2014
EXPIRATION DATE: April 22, 2015
REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited Review

Dear Dr. Bersamin and Ms. Walch:

The Alaska Area Institutional Review Board has given approval through Expedited Review to the protocol 2013-12-035 Traditional food security and diet quality for urban Alaska Native women. Tribal approval is required in addition to IRB approval. The protocol was approved on April 23, 2014 and has an **expiration date of April 22, 2015**.

As a reminder, the protocol and all accompanying documents **may not have modifications** for this decision to remain valid. It is your responsibility as Principal Investigator (PI) to maintain the status of your project by tracking and monitoring all activities related to the protocol. All research approved by the Alaska Area IRB is subject to 45 CFR 46 "Protection of Human Subjects" regulations, the US Food and Drug Administration regulations and the principles of the Belmont Report. Investigators are expected to be familiar with these provisions and adhere strictly to all requirements. You are required to have all personnel involved in the research complete the training at www.citiprogram.org, with a 75% proficiency in all modules once every 36 months. Please retain your completion certificates from the Collaborative Institutional Training Initiative (CITI).

Prior to making any changes to the protocol you must receive approval from the Alaska Area IRB. The IRB does not accept modifications and the Status Report and Renewal Application at the same time. Please ensure that project information is complete and submitted to the IRB using the electronic submission process at IRBNet at least four weeks prior to the expiration date of the project. In addition remember that the IRB agenda is closed on the first day of each month; all complete submissions received after the first day of each month will be placed in the IRB queue for the next IRB meeting.

The Alaska Area IRB has moved to an electronic submission process using IRBNet. To submit to the IRB proceed to IRBNet (www.irbnet.org) and log in to your existing project. The continuing review information

ALASKA NATIVE
TRIBAL HEALTH
CONSORTIUM

February 10, 2016

Amanda Walch
3211 Providence Drive
146 Professional Studies Building
Anchorage, Alaska 99508

RE: Manuscript_Walch_Traditional food security and diet quality for urban Alaska Native women

Dear Ms. Walch,

Your thesis, "Traditional food security and diet quality for urban Alaska Native women" was reviewed and approved by the ANTHC Health Research Review Committee at their February 10, 2016 meeting.

Please forward a PDF copy of any publication resulting from this manuscript to rampreview@anthc.org so that I can share it with the HRRC at a future meeting.

Thank you for submitting your manuscript for ANTHC review and approval.

Sincerely,

Abbie Willette Wolfe, MA
Manager of Research Services
Clinical & Research Services
Community Health Services
Alaska Native Tribal Health Consortium
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Chapter 3 Traditional Foods and Diet Quality in Urban Alaska Native Women Receiving WIC Assistance[1]

3.1 Abstract

Little is known about the role of traditional foods in food security and diet quality of Alaska Native peoples, particularly for women of childbearing age participating in food assistance programs. The objectives of the research were to 1) estimate diet quality and food security among low income, Alaska Native women living in an urban community, and 2) to understand how intake of traditional foods affects these estimates. A cross-sectional study used surveys to quantify dietary intake, assess food security status, and measure diet quality to determine any associations with traditional food intake. A convenience sample of 71 Alaska Native women receiving WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) assistance were recruited from two clinics in Anchorage, Alaska. Most participants were between the ages of 18 – 39 years, were single, had at least some high school education, had an annual income of less than $25,000, and were food insecure at some point in the past year. The average intake of traditional foods was 3.7% of total calories and participants' diet quality averaged a 48 on the Health Eating Index (HEI). Regression models indicated that in low income Alaska Native women living in urban Alaska an increase of 10% of traditional foods showed an increase of 7.3 points on the HEI. Increased education and advocacy of traditional food intake for this population can help increase overall nutrition and long-term health status.

[1] Prepared for submission for a journal to be determined; using APA citation style. By Amanda Walch, MPH and Andrea Bersamin, PhD

3.2 Introduction

In Alaska Native communities, changes are occurring in the physical and social environments that negatively impact access to and intake of traditional foods (Ballew et al., 2004; Gerlach, Loring, Turner, & Atkinson, 2011; Loring & Gerlach, 2015; Magdanz, Smith, Braem, Fox, & Koster, 2011). These changes have precipitated what is commonly referred to as a nutrition transition, which is characterized by replacement of traditional, subsistence foods with highly processed "store" foods. Indeed, current estimates indicate that on average Alaska Native people in rural areas consume just 15-22% of their calories from traditional foods (Ballew, Tzilkowski, Hamrick, & Nobmann, 2006; Bersamin, Zidenberg-Cherr, Stern, & Luick, 2007); this estimate is likely even lower in urban communities where data from the Alaska Department of Fish and Game estimates nearly 93% less traditional food is eaten than in rural areas (Wolfe, 2004). Globally, nutrition transitions are associated with a decline in diet quality and a concomitant elevation in risk of developing chronic diseases (Damman, Eide, & Kuhnlein, 2008; Johnson, Nobmann, Asay, & Lanier, 2009; Popkin, & Gordon-Larsen, 2004).

Although intake of traditional foods has declined among Alaska Native people, traditional foods contribute disproportionately high levels of several important nutrients. Studies in Western Alaska demonstrate that diets high in traditional foods are significantly higher in vitamins A, D, and E, iron, protein, and long chain n-3 fatty acids than diets low in traditional foods (Bersamin et al., 2007; Sharma, Mead, Simeon, Ferguson, & Kolahdooz, 2015). Consistent with this dietary data, the red blood cell membranes of Alaska Native people whose diets emphasize traditional foods are characterized by a fatty acid profile promoting greater cardiovascular health than diets emphasizing Western foods (Bersamin, Luick, King, Stern, & Zidenberg-Cherr, 2008). While it is well recognized that traditional foods are nutrient dense, it is unknown how traditional foods affects overall diet quality.

An overall measure of diet quality may be a better indicator of dietary patterns and predictor of disease risk than a measure of intake of individual nutrients because foods contain a mix of nutrients and other substances, including in some cases environmental toxicants that

interact in complex ways (Hu, 2002; Kant, 1996; Loring, Duffy, & Murray, 2010). The Healthy Eating Index, an index of overall diet quality, was developed to assess how well diets align with the Dietary Guidelines for Americans. In a systematic review by Wirt & Collins (2009), higher HEI scores were associated with lower chronic disease risk and all-cause mortality.

This study explores how consumption of traditional foods affects diet quality among low income Alaska Native women living in an urban center. Low income Alaska Native women in urban centers are seriously underrepresented in nutrition research, despite the fact that more than half of Alaska Native people today live in urban settings, and young women are the primary demographic moving to urban from rural communities (Hamilton & Seyfrit, 1994). Our results have the potential to contribute not only to our understanding of the links between traditional food intake, food security, and diet quality in this vulnerable population, but also to important decision making processes related to policies and programs designed to promote food security, diet quality and health.

3.3 Methods

Study Design

Alaska Native women who were 18 years or older, neither pregnant or lactating, and were enrolled in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) food assistance program were recruited from WIC offices in two urban clinics between September 2014 and June 2015. Demographic data collected included participants' age, marital status, education level, and annual income level. Participants completed a demographics questionnaire, two 24-hour dietary recalls, a food frequency questionnaire (FFQ) adapted from the Traditional Alaska Diet Survey, and the USDA Adult Food Security Survey Module (United States Department of Agriculture, 2015). All instruments were interviewer administered. The research was approved by the University of Alaska Fairbanks and the Alaska Area Institutional Review Boards. Participants received prepaid gift cards to a grocery store as compensation for completing all surveys (3.8 Appendix).

Diet Quality

Two 24-hour recalls were collected from each participant by certified interviewers using the Nutrition Data System for Research (NDS-R) software (version 2014, Regents of the University of Minnesota, Minneapolis). The software was selected since its database includes many Alaska Native foods and has been successfully used in other research looking at traditional food intake and Alaska Native people (Bersamin et al., 2008; Nobmann et al., 2005). Participants were asked to recall all food and beverages consumed over a 24-hour period using a multiple-pass approach that is built into the software to minimize recall bias. The first recall was conducted in-person and the second recall was conducted over the phone within two weeks of the initial recall.

Food and nutrient calculations were performed using the NDS-R Food and Nutrient Database. Diet quality was assessed by calculating the Health Eating Index-2010 score from the NDS-R output files, using the methods described by the University of Minnesota to assess how well the participants' diet aligned with the Dietary Guidelines for Americans. The twelve components of the score include total vegetables, total fruit, whole fruit, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, fatty acids, refined grains, sodium, and empty calories. Each component is differentially weighted and the highest possible score is 100, with higher scores indicating better diet quality.

Traditional Food Intake

Estimates of traditional food intake as a percent of daily calories were calculated from the two 24-hour recalls and a food frequency questionnaire (FFQ) adapted from the Alaska Traditional Diet Survey, a validated survey that included 176 traditional, Alaska Native foods that represent the most commonly consumed traditional foods in Alaska (Ballew et al., 2004). Modifications to the FFQ included adding commonly consumed traditional foods that were missing such as agutuk and specific varieties of seal. Participants were asked to estimate the

portion size and frequency of the portion consumed for each traditional food over the past 12 months. An interviewer guide was developed to standardize data collection by providing coding rules and definitions for commonly used words within the FFQ. To estimate average daily intake of traditional foods, data from the FFQ were entered into the NDS-R software and estimates were divided by 365 days. To estimate percent calories from traditional foods, average daily traditional food intake was divided by average calories consumed as estimated from the 24-hour recalls.

Food Security

Food security status over the prior 12 month period was assessed using the validated 10-item U.S. Adult Food Security Survey Module (USDA, 2015). Food security scores range from 0 to 10, with lower scores indicating higher food security. Following the guidelines set by the USDA to determine food security status, participants were classified in the following four groups: high food security (0-2 points); marginal food security (3-5 points); low food security (6-8 points); and very-low food security (9-10 points).

Statistical Analysis

All data analysis was performed using SPSS software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). Descriptive statistics were calculated (frequencies and means) to characterize the study population. Linear regression models were used to determine the association between traditional food intake and diet quality. A *P*-value of <=0.05 was considered statistically significant.

3.4 Results

The majority of the 73 participants in the study were between the ages of 18 – 39 years (88%), were single (61.5%), had no college experience (64.5%), and had an annual income of less than $25,000 (68.5%) (Table 3.1). Additionally 50.6% of the participants were clearly food

insecure, with about one in five (20.5%) assessed at low food security, and 30.1% experiencing very low food security. In addition, almost one-third (32.9%) of those assessed were only marginally food secure. Traditional food intake was generally low. Participants who completed both the 24-hour recalls and the FFQ (n = 62) consumed an average of 3.7% (+/- 3.3% SD) of their calories from traditional foods.

Table 3.1 Socioeconomic Characteristics of Participants (n=73)

Characteristic	**Number**	
Age		
18-29 years	33	45.2%
30-39 years	31	42.5%
40+ years	9	12.3%
Marital Status		
Married	16	22%
Divorced/Separated	8	11%
Single	45	61.5%
Other	4	5.5%
Education		
Less than 12 years	16	22%
High school graduate or GED	31	42.5%
Some college	9	12.5%
Technical training or Associates	16	22%
Bachelor's degree	1	1%
Annual Income		
Less than $10,000	34	46.5%
$10,000-24,999	16	22%
$25,000-44,999	9	12.3%
$45,000-64,999	3	4.1%
Don't know or refused	11	15.1%
Food Security Status		

Table 3.1 Socioeconomic Characteristics of Participants (n=73) continued

High food security	12	16.4%
Marginal food security	24	32.9%
Low food security	15	20.5%
Very low food security	22	30.1%
Traditional food intake (% kcal)	3.7 (3.3) [a]	2.6 (0-14.7) [b]
Less than 1% kcals	12	19.4%
1-3% kcals	25	40.3%
>3% kcals	25	40.3%

[a]Values are mean (SD)
[b]Values are median (range)

The average diet quality score of the participants was 48 out of 100. Women scored well below the maximum possible score on all components of the HEI. Intake of fruit, vegetables, greens and beans, and whole grains was particularly low, with women scoring less than 35% of possible scores on each of these components. Although women scored highest on total protein foods (86% of the total possible score), intake of seafood and plant protein was very low (22% of the total possible score), which reflects low intake of traditional foods (Table 3.2).

Table 3.2 Healthy Eating Index Scores Among Participants (n=62)

HEI Component (maximum score)	**Score (Std Dev)**	**Percent of Total Possible**
Adequacy (higher score indicates higher consumption)		
Total fruit (5)	1.3 (1.5)	26
Whole fruit (5)	1.0 (1.5)	20
Total vegetable (5)	2.3 (1.2)	46
Greens and beans (5)	1.0 (1.6)	20
Whole grains (10)	3.5 (3.2)	35

Table 3.2 Healthy Eating Index Scores Among Participants (n=62) continued

Dairy (10)	4.5 (2.5)	45
Total protein foods (5)	4.3 (1.2)	86
Seafood and plant protein (5)	1.1 (1.9)	22
Fatty acids (10)	4.6 (2.7)	46
Moderation (higher score indicates lower consumption)		
Refined grains (10)	5.5 (3.2)	55
Sodium (10)	4.4 (3.4)	44
Empty calories (20)	14.7 (4.2)	74
Total	48.0 (9.9)	48

We conducted a linear regression analysis in order to examine the association between traditional food intake and diet quality. Results indicated that a higher diet quality was associated with higher traditional food intake (β=0.250; t =2.50; p =0.05). Using the coefficients from the model, we calculated that an increase in 10% calories from traditional foods (equivalent to approximately 195 kcals) was associated with a 7.3 point increase on the Healthy Eating Index (equal to one standard deviation for the entire sample). No significant association was observed between traditional food intake and food security status (p=0.089).

3.5 Discussion

To our knowledge this is the first published study to examine the relationship between intake of traditional foods and an overall measure of diet quality in an urban Alaska Native population. We found that despite very low intakes of traditional foods (3.7% of daily calories), a relatively modest increase (approximately 195 kcal/ day) has the potential to substantially improve diet quality among low income Alaska Native women in an urban center. Given that the majority of women (65%) were classified as having very poor diet quality (a score below 51 on the HEI scale), our findings highlight the importance of identifying and supporting policies and programs that ensure consistent access to traditional foods in urban areas.

Low income Alaska Native women in urban areas face substantial challenges to accessing traditional foods (Alaska Department of Labor and Workforce Development, 2015). Our estimate of traditional food intake was substantially lower than previous studies in rural areas. Research on traditional food intake in urban areas is more difficult to compare, with estimates expressing the percentage of people who consumed traditional foods at least once in the given study period. Nobmann and Lanier (2001), for example, estimated that traditional foods were consumed by 27% of participants at least once during four 24-hour recalls. Similarly, Redwood et al. (2008) reported that 92% of participants in an urban Alaska community consumed traditional foods at least once in a year time period.

Food security rates in our study indicate that Alaska Native WIC participants in urban areas are 40% more likely to be food insecure than the overall female population in Alaska (50.6% compared to 10.3%, respectively) and Alaska Native people (19.2%) (Alaska Department of Health and Social Services, 2015). In a population who already experiences health inequities, high food insecurity rates can only exacerbate potential health issues. Our results did not show an association between food security and diet quality or traditional food intake, however. Despite the lack of statistical significance many participants expressed a desire for increased access and intake of traditional foods which warrants further attention and exploration.

Diet quality in the United States, measured by the Healthy Eating Index, is marginally higher than the average of the participants in our study. The average HEI scores in the US range from 49-54 out of 100 depending on the household's income level (USDA, 2015), where our results found an average HEI score of 48. Despite having similar averages, few participants met the Dietary Guidelines as assessed by the HEI. Participants fell short of recommendations in many categories, including consuming adequate whole grains, fruits, vegetables, and high intakes of empty calories. Overall, those with low diet quality have a higher chronic disease risk, most notably for obesity, type 2 diabetes, and all-cause mortality (Fung, McCullough, Van Dam, & Hu, 2007; Wirt & Collins, 2009). Our findings are important to inform intervention programs

aimed to improve dietary adequacy in this high-risk population. Additionally, any intervention programs will need to consider the populations' families since many WIC participants are either pregnant, breastfeeding, or have children.

There were several limitations in the study. Traditional foods are infrequently consumed foods and are notoriously difficult to assess with standard dietary assessment methods (Sharma et al., 2008). We attempted a better estimate of intake by using two 24-hour recalls in combination with a FFQ that assessed annual intake of traditional foods. Our study was also limited by a small sample size and non-random selection; our findings, therefore, may not be representative of the experience of all low income Alaska Native women.

3.6 Conclusion

Our data demonstrate the high rates of food insecurity and the importance of traditional foods to bolstering diet quality in Alaska Native women in urban areas. In order to reduce health disparities, chronic disease burden and associated health care costs, policy should consider ways to decrease food insecurity and increase access to traditional foods. The mission of federal and state food and nutrition assistance programs is to improve diet quality and food security among low income Americans, and they should consider policies to increase traditional foods to do so. Additionally education and intervention efforts should aim at strategies to increase traditional food access and intake, which could include lessons on preparing and storing traditional foods, a desire expressed by some participants. These efforts have the ability to impact not only the population in our study, but their families as well.

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3.8 Appendix

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www.uaf.edu/irb

Institutional Review Board
909 N Koyukuk Dr. Suite 212, P.O. Box 757270, Fairbanks, Alaska 99775-7270

October 4, 2013

To: Andrea Bersamin, PhD
Principal Investigator

From: University of Alaska Fairbanks IRB

Re: [518629-1] Traditional food security and diet quality for urban Alaska Native women

Thank you for submitting the New Project referenced below. The submission was handled by Exempt Review. The Office of Research Integrity has determined that the proposed research qualifies for exemption from the requirements of 45 CFR 46. This exemption does not waive the researchers' responsibility to adhere to basic ethical principles for the responsible conduct of research and discipline specific professional standards.

Title:	Traditional food security and diet quality for urban Alaska Native women
Received:	October 2, 2013
Exemption Category:	2
Effective Date:	October 4, 2013

This action is included on the November 6, 2013 IRB Agenda.

A very well done package with no modifications needed, and with no perceivable threats to research personnel or respondants; however, here are some*suggestions*:

Demographics Questionnaire:

All Alaska Native groups except Athabascans denoted separately, though Alutiiq (Alutiit/Sugpiat) and Eyak are not metioned at all. Diacritical marks used, but not on Iñupiat(q). Siberian Yup'ik people call themselves *Yuit*. No requirement to change, but might consider it.

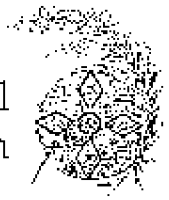
All questionnaires:

Most questions have "refused" option; suggestion that this be made evident (orally or writen) that this applies to *every* question.

Traditional Food FFQ question 7:

Hooligan (Eulachon) grease is consumed frequently and is culturally important, especially in SE/SC AK--may want to consider adding this option to question 7. If you choose to make this change please submit your modified questions in IRBNet.

Southcentral Foundation



February 11, 2014

Andrea Bersamin, PhD
PO Box 757000
Fairbanks, AK 99775
Phone: (907)474-6129
E-mail: abersamin@alaska.edu

Dear Dr. Bersamin:

Your concept proposal 'Traditional food security and diet quality for urban Alaska Native women' has been approved by the Southcentral Foundation (SCF) Executive Committee on February 11, 2014.

This indicates permission from SCF to develop and submit a full research proposal to the Alaska Area Institutional Review Board and funding agency (as applicable).

Please follow the instructions provided by the Alaska Area Institutional Review Board notifying you of the next step in the review process. Once Institutional Review Board approval is received, please re-contact the SCF Research Department to begin the tribal review approval process for the full proposal.

If you have any questions, please contact the SCF Research Department at 907-729-3623 or scfresearchreview@scf.cc.

Sincerely yours,

SOUTHCENTRAL FOUNDATION

Denise Dillard, Ph.D.
Director of Research

Alaska Area Institutional Review Board

4315 Diplomacy Drive - RMCC
Anchorage, AK 99508
Phone: (907) 729-3924

DATE: April 29, 2014

TO: Andrea Bersamin, PhD
Principal Investigator
Amanda Walch
University of Alaska Fairbanks
PO Box 75700
Fairbanks, Alaska 99775

FROM: Alaska Area Institutional Review Board (IHS IRB #2)

STUDY TITLE: [518629-3] Traditional food security and diet quality for urban Alaska Native women

IRB REFERENCE #: 2013-12-035

SUBMISSION TYPE: New Project

ACTION: APPROVED

APPROVAL DATE: April 23, 2014

EXPIRATION DATE: April 22, 2015

REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited Review

Dear Dr. Bersamin and Ms. Walch:

The Alaska Area Institutional Review Board has given approval through Expedited Review to the protocol 2013-12-035 Traditional food security and diet quality for urban Alaska Native women. Tribal approval is required in addition to IRB approval. The protocol was approved on April 23, 2014 and has an **expiration date of April 22, 2015**.

As a reminder, the protocol and all accompanying documents **may not have modifications** for this decision to remain valid. It is your responsibility as Principal Investigator (PI) to maintain the status of your project by tracking and monitoring all activities related to the protocol. All research approved by the Alaska Area IRB is subject to 45 CFR 46 "Protection of Human Subjects" regulations, the US Food and Drug Administration regulations and the principles of the Belmont Report. Investigators are expected to be familiar with these provisions and adhere strictly to all requirements. You are required to have all personnel involved in the research complete the training at www.citiprogram.org, with a 75% proficiency in all modules once every 36 months. Please retain your completion certificates from the Collaborative Institutional Training Initiative (CITI).

Prior to making any changes to the protocol you must receive approval from the Alaska Area IRB. The IRB does not accept modifications and the Status Report and Renewal Application at the same time. Please ensure that project information is complete and submitted to the IRB using the electronic submission process at IRBNet at least four weeks prior to the expiration date of the project. In addition remember that the IRB agenda is closed on the first day of each month; all complete submissions received after the first day of each month will be placed in the IRB queue for the next IRB meeting.

The Alaska Area IRB has moved to an electronic submission process using IRBNet. To submit to the IRB proceed to IRBNet (www.irbnet.org) and log in to your existing project. The continuing review information

ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

February 19, 2016

Amanda Walch
3211 Providence Drive
146 Professional Studies Building
Anchorage, Alaska 99508

RE: Manuscript_Walch_Traditional food security and diet quality for urban Alaska Native women

Dear Ms. Walch,

Your thesis, "Traditional food security and diet quality for urban Alaska Native women" was reviewed and approved by the ANTHC Health Research Review Committee at their February 10, 2016 meeting.

Please forward a PDF copy of any publication resulting from this manuscript to rampreview@anthc.org so that I can share it with the HRRC at a future meeting.

Thank you for submitting your manuscript for ANTHC review and approval.

Sincerely,

Abbie Willette Wolfe, MA
Manager of Research Services
Clinical & Research Services
Community Health Services
Alaska Native Tribal Health Consortium
3900 Ambassador Drive, Suite 207
Anchorage, Alaska 99508
P: (907) 729-2901 / F: (907) 729-2924

General Conclusion

This dissertation addresses the need to understand the relationship between traditional foods, food security, and diet quality, and how they collectively influence the health of low income Alaska Native women. We know that traditional foods contain high levels of important nutrients such as fat-soluble vitamins, protein, and omega-3 fatty acids (Ballew, Tzilkowski, Hamrick, & Nobmann, 2006; Bersamin, Zidenberg-Cherr, Stern, & Luick, 2007; Johnson, Nobmann, Asay, & Lanier, 2009) and they protect against the development of chronic diseases such as glucose intolerance and cardiovascular disease (Johnson, Nobmann, & Asay, 2012; Nobmann, Byers, Lanier, Hankin, & Jackson, 1992). However, research on traditional food intake is limited in urban areas, especially among low income Alaska Native women. This high risk population continues to rise in urban areas and the access to these important foods, and how they relate to food security, are unknown. Food security is contingent upon access to traditional foods (Lambden, Receveur, & Kuhnlein, 2007; Sharma, 2010).

In chapter 1 a systematic literature review on traditional food security in Alaska was conducted. The review yielded 28 articles that were categorized into three types of research: those that quantified traditional food intake (n=19), those that quantified food security (n=2), and qualitative articles that addressed at least one pillar of food security (n=8). The three categories evaluated how traditional foods related to the pillars of food security in Alaska. Factors that appear to influence traditional food availability and access include climate change, food sharing, living in urban areas, costs associated with following a traditional lifestyle, and changing food preferences. The second chapter estimated the intake of traditional food among urban Alaska Native women and examined the associations between participants' attitudes and beliefs and intake of traditional foods. Participants were mixed on their opinion of the economic value of traditional foods and the relative healthfulness of traditional foods. Linear regression models indicated that participants who ate more traditional foods were more likely to have traveled to a rural Alaska Native community in the past year ($p=.001$) and had a preference for traditional foods over store-bought foods ($p=.001$). The third chapter reported on estimated diet quality and food security in the population and sought to understand how the intake of traditional foods

affected these estimates. Results indicated the average intake of traditional foods was 3.7% of total calories and participants' diet quality averaged a 48 out of 100 possible points on the Health Eating Index (HEI). A multivariate regression model indicated that traditional food intake was positively associated with higher diet quality scores. An increase of 10% of traditional foods showed an increase of 7.3 points on the HEI.

In summary, this dissertation provides evidence that traditional food intake improves diet quality. While previous research from Alaska reported research on traditional food intake and food security in rural areas, current estimates in an urban area were unknown. Data from this research will be useful for policy and practice. Increased education and advocacy of traditional food intake for this population can help increase overall nutrition and long-term health status. Based on the collective findings from the research I recommend the following: 1) nutrition education in food and nutrition assistance programs should be culturally relevant and address the barriers associated with access and availability of traditional foods in urban areas, 2) data should be used to inform intervention programs to improve dietary adequacy in this high-risk population, and 3) policies should be explored to change foods acceptable for purchase through the WIC program to promote diet quality and aid in chronic disease prevention in the Alaska Native population.

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